DOCUMENT RESUME

ED 284 037 CE 047 856

TITLE	The Model Industrial Technology Systems Project.
INSTITUTION	Bowling Green State Univ., Ohio.
SPONS AGENCY	Ohio State Dept. of Education, Columbus.
PUB DATE	87
NOTE	184p.; Sponsored in cooperation with the Ohio Industrial Technology Education Association. Some pages may not reproduce well.
PUB TYPE	Reports - Descriptive (141) -- Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF01/PC08 Plus Postage.
DESCRIPTORS	Behavioral Objectives; Communications; Construction (Process); Curriculum Development; Demonstration Programs; Educational Resources; Elementary Secondary Education; *Industrial Education; Industry; *Integrated Curriculum; Learning Activities; *Lesson Plans; Manufacturing; Models; Pilot Projects; Program Implementation; *Science Instruction; Science Projects; *Technology; *Units of Study

ABSTRACT

This document contains materials used in a model industrial technology program that introduced technology into the curricula of elementary, middle, and high schools in three sites in Ohio: the Central site (coordinated through Ohio State University); the Northeast site (coordinated through Kent State University); and the Northwest site (coordinated through Bowling Green State University). A short summary of the second year's activities is followed by four appendices that constitute the bulk of the document. Appendix A consists of curriculum materials suitable for elementary school classes. Each of the 16 units contains a concept, activity, objective, levels of awareness, demonstration, participation, and vocabulary. Units cover the following topics: technology alphabet book, light, measure, tools, logo communications, natural/synthetic construction, pictographs, molds/fossils, ergonomics, photocopies, Rube Goldberg, paper alteration, real wood, rapid communication, bubbles and spheres, and domino constructions. Appendix B contains high school curriculum materials classified according to a technology taxonomy. High school units contain background, objectives, introduction, activity questions, activity, and suggested equipment and supplies. Eight lessons center on communication technology, and 23 lessons focus on various aspects of manufacturing technology. Appendix C includes letters to the satellite schools involved in the project, and Appendix D contains project publicity materials. (KC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED284037

THE MODEL INDUSTRIAL TECHNOLOGY SYSTEMS PROJECT

Dr. Ernest N. Savage
Project Director
Bowling Green State University
Bowling Green, Ohio

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

F B Walter

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

CE047856

A Project Sponsored by the Ohio Department of Education in Cooperation with the Ohio Industrial Technology Education Association

BEST COPY AVAILABLE

AUG 13 1987 RECEIVED
RECEIVED
OHIO VO-ED-DEPT

THE MODEL INDUSTRIAL TECHNOLOGY SYSTEMS PROJECT

July 15, 1987

PROJECT DIRECTOR:
Dr. Ernest N. Savage
Bowling Green State University
(419)-372-8873

PROJECT SECRETARY:
Mrs. Marsha S. Bateleman
Bowling Green State University
(419)-372-8873

PROJECT MONITOR
Mr. Joe R. Logsdon
Ohio Department of Education
(614)-466-2211

CENTRAL SITE:
Dr. Paul E. Post,
Site Co-Director
Dr. William D. Umstatd,
Site Co-Director
The Ohio State University
(614)-422-7471

COLUMBUS CITY SCHOOLS:
Mr. James L. Cameron,
Supervisor Career Education
(614)-464-9901

NORTHEAST SITE:
Dr. Terry J. Squier,
Site Director
Kent State University
(216)-672-2892

SPRINGFIELD LOCAL:
(Summit County)
Mr. James D. Gray,
Superintendent
(216)-784-0421

NORTHWEST SITE:
Dr. Ronald E. Jones,
Site Director
Bowling Green State University
(419)-372-7567

SPRINGFIELD LOCAL
(Lucas County)
Dr. George E. Tandaugh,
Superintendent
(419)-866-0800

Mr. Joe Logsdon
Department of Education
Division of Elementary and Secondary Education
Support Services
Ohio Departments Building
Room 1005
65 South Front Street
Columbus, OH 43215

Dear Joe:

The Model Industrial Technology Systems Project (1A-01-87) has completed its second year of operation. The final report for this project will include information and documentation regarding the following topics:

* Project Office Activities
* Site Activities
* Curriculum Development
* Satellite Programs
* Project Publicity
* Sex Equity
* Proposal for Third Year of Project

The project has completed a great year during its second year. I am looking forward to working closely with you on the third year of the project as we continue to create a viable and educationally sound Industrial Technology Education curriculum for all students in the state of Ohio.

Sincerely,

Dr. Ernest N. Savage
Project Director

ENS:msb/R6
Enclosures
cc: Dr. G. R. Bowers
Mr. J. Pinchak
Mrs. M. J. Poston
Dr. T. J. Squier
Drs. W. D. Umstattd/P. E. Post
Dr. G. A. Sterling (2 Copies)

PROJECT OFFICE ACTIVITIES

The project office has the fiscal responsibility for the project. During the second year, each of the three model school sites were budgeted $10,000. These funds have been used for the most part for curriculum support and travel and to a limited extent as seed money to purchase experimental material and supplies that we used to pilot some of the more unique activities of the project.

The project office used its budget of $10,000 primarily for curriculum support, travel, and product dissemination and communication regarding the status of the project locally, state-wide, nationally, and internationally. On the international front, we have received and responded to inquiries from the University of Alberta, Canada, and have interacted with individuals from the Netherlands through the International Technology Education Association (ITEA). As an indicator of the volume of communication regarding this project, the office has consumed approximately 23,838 sheets of paper in the second year of operation.

SITE ACTIVITIES

It continues to be the intention of this project to develop three unique sites each of which would reflect its own curriculum focus. As we conclude the second year of the project, each site has taken on its unique personality based upon the enthusiasm, technical strength, and motivation of the site coordinators, teachers, and administrators.

The Central Site coordinated through The Ohio State University has created the most excitement through its association with Cranbrook Elementary School. "Technology Hour" has been the talk of the school. Feedback from parents, teachers, the principal, and especially the children has been constructive, encouraging, and positive. Dominion Middle School has been implementing activities to upgrade and update the current curriculum. This is a very creative and organized program which illustrates the appropriateness and importance of Industrial Technology in the middle school environment. Northland and Beechcroft High Schools have been very patient and helpful in the development of activities. The enormous amount of materials for the four areas (communication, construction, energy/power, and manufacturing) has slowed the implementation. However, much progress has been made for fall implementation for the third year.

The Northeast Site coordinated through Kent State University has focused its elementary school activities toward the preparation of teachers to implementation technology activities as an integral part of the curriculum. The middle school remains the focal point of the Northeast Site. Today, after only two years of the project, all sixth graders are afforded an opportunity for hands-on study of technology. The traditional, general shops at each of the two middle schools have been changed into comprehensive technology learning laboratories. The major changes are the addition of learning centers to include a resource area for textbooks, study aids, and audio visual

materials; a computing center and the development of laboratory space to provide activities in the four technology areas. The senior high school has made progress in redesigning the curriculum. Students have been registered for the new curriculum offerings which will reflect an in-depth study of the concepts developed at the middle school.

The Northwest Site coordinated through Bowling Green State University has used the total concept approach of bringing along all three areas with equal emphasis. Elementary school teachers K-4 have been actively involved in integrating technology-related activities using the tri-plan approach into their existing curriculum. Favorable responses from all constituents have provided encouragement to pursue this effective and appropriate delivery system. The middle school program has identified a ten-week unit on understanding technology; a five-week unit on technical communications; and a two-week unit on practical home mechanical skills for the required Industrial Technology course. Student, instructor, administrator, and parent feedback regarding this program are favorable. The high school program is in the process of a major curriculum revision. It has been proposed that seven traditional courses be eliminated and that five new courses reflecting Industrial Technology be initiated and implemented by either September, 1987; January, 1988; or September, 1988.

CURRICULUM DEVELOPMENT

The process of creating, adapting, adopting, and implementing curriculum faces the same road blocks regarding change as would any new product on the market. False starts and minor directional errors have occurred which upon analysis have strengthened and resolved that the direction we are presently pursuing is educationally sound and appropriate. The elementary school technology education curriculum materials (Appendix A) reflect general technology with an industrial technology focus. The 16 units that have been developed have been well received by teachers because of their adaptability and facility for integration into the crowded elementary school curriculum K-4. The format used for these activities is innovative and easy to implement.

The middle school curriculum materials are still in the process of revision. We feel that the middle school link is the most important to the success of any Industrial Technology Program. Therefore, it is essential that that program relates in an articulated manner to the broad nature of the elementary school activities while allowing students to understand the complex nature of Industrial Technology taught at the high school level. It is expected that all courses for the middle school; grades 6, 7, 8; will be completed by September 1, 1987. These will then be piloted and validated in the fall and ready for implementation immediately thereafter. This is not to mean that quality instruction at the middle school at all three sites is not presently occurring; in fact, the most innovative activities are occurring at that level. The difficulty in curriculum development is to harness this creativity into a positive and reproducible program.

The high school curriculum process is also undergoing an identity crisis. Initially, it was intended that six-week units be developed for each of the four Industrial Technology Systems for each of the three years of the project. This would have resulted in the identification of four one-semester courses in each Industrial Technology System area. It has been determined that a more efficient way of delivering content in the four areas is to link various activities or modules to those taxonomy areas identified in the Industrial Technology Systems Handbook. Some of the activities have already been classified accordingly and can be found in Appendix B.

SATELLITE PROGRAMS

Seven schools have been identified as Satellite School Programs (Appendix C) of the Model Industrial Technology Systems Project. Each of those schools has been visited and evaluated by the Ohio Department of Education Project Monitor, Mr. Joe Logsdon, the Project Director, Dr. Ernest Savage, or both individuals. Nine other schools have requested satellite status but have not as yet been visited. Each visitation includes a review of the formal curriculum, observation of classroom activities, and visitation with administration.

Those schools that have received satellite status receive curriculum material from the project office. Included in that material are the 16 units developed for elementary school technology education; new course material developed for the middle school; and four six-week units for high school industrial technology focusing on the four Technology Systems. They will also receive our format for course development. The satellite schools will provide us with their courses roughed out along our format guidelines so that we may include their course material in further dissemination of our Model Schools Instructional Materials. It is expected that the success of the Model Schools Project will be significantly enhanced by the effectiveness of the Satellite School Program. These programs in effect help to disseminate information regarding Industrial Technology Education to a constituency larger than that which could be addressed by the Model School sites.

PROJECT PUBLICITY

Publicity regarding the three model school sites at the local level has been adequate (Appendix D). At the state level, three presentations were given relative to the project at the Ohio Industrial Technology Education Association (OITEA) Conference in Dayton, Ohio. Those presentations were: "Elementary School Technology Education - A new focus on the infusion of technology into the elementary curriculum" by Rand Russell; "Junior High/Middle School Industrial Technology: It's Working and It's Exciting!" by Robert Bauer and Grant Luton; and "High School Industrial Technology - A review of the status of the Model Schools Program" by William Umstattd and Paul Post. Two presentations were also given at the International Technology Education Association (ITEA) Conference held in Tulsa, Oklahoma, entitled "Ohio's Model School Program for Elementary Education" by Ernest Savage and Larry Hatch. This is a practical

description of how children are learning about technology education in Ohio's Model School Program. The other presentation entitled "Springfield Local - Summit County - Technology Education" by Terry Squier provided the rationale, course content, and scope and sequence of the Technology Education program in Summit County.

SEX EQUITY

The Ohio Department of Education, Division of Vocational Education, Sex Equity office has once again supported the activities of the project through grants provided to supplement sex-fair resource material as library reference material. The project is committed to the delivery of content that is not only sex-fair, but is also relevant and necessary to the liberal education of all boys and girls.

PROPOSAL FOR THIRD YEAR OF PROJECT

The Memorandum of Understanding: Responsibilities of Program Participants in the Industrial Technology Systems Development Site Project presented to the Ohio Department of Education fall, 1985, presented a three-year program for the implementation of Industrial Technology curriculum for Industrial Arts in Ohio.

In that Memorandum of Understanding, the Ohio Department of Education, Division of Vocational Education, under Article 1., Financial Support, states that they would "provide a total of forty thousand dollars ($40,000.00) each year, for a period of three (3) years, for the development of pilot programs in industrial technology at three designated local education agency sites."

We believe that the second year of the project is meeting or exceeding the guidelines of the Memorandum of Understanding. We will satisfactorily complete all goals and objectives for the second year of the project within given time lines. As such, we are requesting the Ohio Department of Education grant approval of the project for a third year of operation at a minimum stipend of forty thousand dollars ($40,000.00). This request is being made at this time in order that we may experience a smooth financial transition into the third year. We understand the project is accountable to the criteria established in the Memorandum of Understanding relative to the overall project and specifically to those items relating to the third year of the project.

Specifically, activities in the third year will relate to the development and pilot-testing of curriculum materials for grades 5-6, 9, and high school as well as the implementation of curriculum established in the second year of the project for grades 3-4, 8, and high school.

APPENDIX A

Elementary Curriculum Materials

TOPIC: "Technabet" Technology Alphabet Book General

CONCEPT:

The impact of technology upon our lives is tremendous. This impact whether a direct application of technologies products or indirect as in the research and development, which produces that technology, is a primary force for the dramatic and rapid changes within our society. However, even as we demand its produce, we feel its influence in our lives. This influence, if not understood, can be a source of anxiety and a target for criticism and opposition not always justified. To be productive members of a technologic society, we must attain a degree of technologic literacy. The initial point for such a literacy is that of awareness, and the foundation for that awareness is the ability to recognize technology in all its forms and its influences upon our society and values.

This activity is designed to illustrate the myriad forms of technology within the student's environment, and in turn develop an understanding and appreciation for technology and its influence.

ACTIVITY:

Following discussion of the concept topic, identify the various applications of technology within the classroom noting their methods of utilization and possible values that students may associate with them. Continue the study by discussing how the various examples influence the student's environment, activities, learning process, and life.

TRI-PLAN

OBJECTIVE:

To illustrate the myriad forms of technology within the student's environment, and in turn develop an understanding and appreciation for technology and its influence.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current applications of various forms of technology within the student's environment. Why do we need the alphabet? words? symbols? . . . from a technological perspective.

DEMONSTRATION:

Identify examples of technological application within the classroom by name and relate them to alphabetical organization.

PARTICIPATION:

Following awareness and demonstration activities, assign the project of locating photographs of items relative to technology whose names begin with each letter of the alphabet and assemble a technabet book.

RELATED ACTIVITIES

AWARENESS:

Produce and utilize flash cards for identification of technology methods, application, and objects.

DEMONSTRATION:

Visit the technology lab to view additional items and processes related to technabets.

PARTICIPATION:

Collect, identify, and display actual objects relative to technabet or photograph them.

VOCABULARY:

Alphabet
Impact
Influence
Society
Technology
Values

TOPIC: Light

CONCEPT:

Light is not only a subject of endless fascination and research for science, but also an absolute necessity for life itself. Over the course of history, mankind first sought only to possess it for security, but technology has shown it to be a valuable tool as well as a psychological asset. Dissatisfied or frightened by the limits of natural lighting, methods of producing artificial light have long been the goal of the sciences and technology. Today, light is created and utilized to facilitate good learning and working habits, stimulate plant growth, to perform delicate surgery, and is even becoming a tool of strategic defense.

This activity is intended to stimulate an awareness of the importance of light to life and in our lives and to demonstrate our ability to utilize and manipulate our most basic energy source -- the sun.

ACTIVITY:

After discussing the concept topic, note the variety of light sources about the classroom identifying and categorizing natural and artificial. Continue that discussion by identifying materials that allow light, both natural and artificial, to pass and further how these materials can be used to control the amount of light and its quality and the need to do so.

Following a discussion of transparent, translucent, and opaque, demonstrate these properties by exhibiting clear Plexiglas, then wet-sanding to produce translucent, and finally spray painting to create opaque material.

TRI-PLAN

OBJECTIVE:

To stimulate an awareness of the importance of light to life, and within our lives, and to demonstrate the manipulation and control of our most basic light source -- the sun.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current applications of light within the student's environment.

DEMONSTRATION:

Discuss and demonstrate three properties of Plexiglas by exhibiting original transparent state, wet-sand to create translucence, and spray paint to create opaque material.

PARTICIPATION:

Following awareness and demonstration activities, student or students will execute the activity of creating a translucent surface and an opaque surface using different processes or coatings than those that were demonstrated.

RELATED ACTIVITIES

AWARENESS:

Study, collect, and discuss the architectural utilization of light controlling materials including those with reflective surfaces such as mirrored buildings.

DEMONSTRATION:

Transform opaque fabric into a translucent material by applying a light oil and discuss the historical application of this material.

PARTICIPATION:

Research the historical use of colored translucent material for decorative architectural use and reproduce such a stained-glass application using colored tissue over thin white paper.

VOCABULARY:

Manipulate

Opaque

Reflective

Stained glass

Translucent

Transparent

PEOPLE AND PLACES:

Notre Dame

Dominic Labino

Edmond Drummond Libbey

Mies Van Der Rohe

Seagate

TOPIC: "The Long and Short of It" Measure General

CONCEPT:

Throughout the day, we make numerous comparisons and references based upon units of measure. As simple as identifying lunch time or as complex as a mathematics problem, such comparisons are frequent and necessary in our society. As the sophistication of our technology has increased so has the requirement for the accurate measure of goods and process. Certainly one of the more important is the necessity to accurately measure distance. The result of the technician's ability to utilize skills related to tool use but guided by measurement is quality. It is, therefore, a skill to be mastered as a prerequisite to a creative and productive activity. Additionally, a working knowledge of measurement and the units of measurement will facilitate the student's ability to conceive size and shape relationships. Although once determined by factors such as the length of a king's arm, the sophistication of measurement has developed as technology has increased its utilization and provided more accurate methods of determining proper measurement.

This activity will introduce or expand student awareness of the process of measurement, the necessity for measurement skills, and the development of those skills.

ACTIVITY:

After a discussion of the concept topic note, identify the variety of methods utilized within the classroom to measure time, activity, weight, and size. Continue the discussion by exhibiting the devices used to measure them and describing their use.

TRI-PLAN

OBJECTIVE:

To introduce or expand student awareness of the process of measurement and the necessity for the acquisition and development of measurement skills.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current applications of measurement within the student's environment.

DEMONSTRATION:

Identify and demonstrate the devices used to measure distance within the classroom.

PARTICIPATION:

Following awareness and demonstration activities, assign the students the project of determining a new measurement unit to determine distance and to utilize that unit to measure objects within the classroom. (e.g. how many paper clips long is your desk?)

RELATED ACTIVITIES

AWARENESS:

Describe the historical methods of determining a unit of measure and relate the need of society and technology for a standard.

DEMONSTRATION:

Using the example of a yard equalling the distance from the thumb to the nose with arm outstretched, demonstrate the comparative length of such a unit among several or all students and the teacher.

PARTICIPATION:

Measure the size of the classroom utilizing the distance from the instructor's nose to thumb as the unit of measure.

VOCABULARY:

Comparison

Measure

Unit

PEOPLE AND PLACES:

National Bureau of Standards

TOPIC: "A Helping Hand" Tools Energy/Power

CONCEPT:

The human hand is a marvel of engineering, possessing exceptional strength in combination with an extraordinary range of motion. It is our primary body feature capable of manipulating objects and altering our environment. The first tools utilized by the human species were probably no more than rocks or tree limbs, readily available, and manipulated to strike or sever. With the increased sophistication of our lives and the resulting demand for a technology to satisfy need and desire, the requirement for tools to assist in the manipulation of the environment was a first focus of that technology. Technology then, not only created the demand for increased efficiency in tool use, but was often responsible for satisfying such a requirement. Although technology, as it now exists, would be a strange concept for early humans, many of our most efficient tools can be readily related in form and function to the human hand.

This activity is designed to increase the awareness of the role of technology in the development of tools, which efficiently execute required tasks, and to relate many of those tools to the structure and function of the human hand.

ACTIVITY:

After a discussion of the concept topic, exhibit and discuss various hand-held tools and identify specific function and use. Continue by relating the form and function where possible to that of the human hand.

TRI-PLAN

OBJECTIVE:

To increase the awareness of the role of technology in the development of tools, which efficiently execute required tasks, and to relate many of those tools to the structure and function of the human hand.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current applications of hand-held tools within the student's environment.

DEMONSTRATION:

Identify and demonstrate tools, which simulate the action/function of the hand and extend its skills, especially those which grip or strike. Many kitchen tools can be used.

PARTICIPATION:

Following awareness and demonstration activities, assign a student or students the project of diagraming the function, structure, and use of a gripping tool and relate it graphically to the human hand. For example, what part of the tool would you substitute for the fingers of the hand?

RELATED ACTIVITIES

AWARENESS:

Introduce and discuss simple machines and relate how they can and do extend the functions of the human body.

DEMONSTRATION:

Visit the technology lab and view demonstrations of similar tools of varying scale and relate function and form to human engineering.

PARTICIPATION:

Design and construct a unique tool to assist in the execution of a simple task.

VOCABULARY:

Function

Grip

Strike

Tool

TOPIC: "Is That For Real?" Natural/Synthetic Construction

CONCEPT:

The earliest shelters were probably those which nature itself had created. A cave or overhang was exposed as ice or water retreated providing ready temporary habitations. Later, as increasing population and needs overextended the numbers of such shelters, semi-permanent habitations were needed. Construction would appear utilizing readily accessible materials such as stone and wood in their natural state. As tools were created to roughly shape these materials, more precise and permanent structures could be created. Today, buildings may be created utilizing only synthetic materials; many of which attempt to imitate the visual or textural characteristics of the natural, but surpass them in strength and utility. Technology continues to provide architects with an expanding and varied array of materials, which improve both the visual and structural qualities of their buildings. Some architects choose to utilize natural materials either partially or exclusively, while others choose to design only in synthetics.

This activity will acquaint students with the qualities of natural and synthetic materials, their similarities and differences, and the construction techniques possible utilizing such materials.

ACTIVITY:

Following discussion of the concept, note the variety of materials utilized in the construction and furnishing of the classroom and identify what is natural and/or synthetic. Continue with discussion of similarities, differences, and utility.

TRI-PLAN

OBJECTIVE:

To acquaint students with the qualities of natural and synthetic materials, their similarities and differences, and the construction or manufacturing techniques possible utilizing such materials.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current applications within the student's environment.

DEMONSTRATION:

Collect, display, and discuss a variety of construction materials noting characteristics such as texture, color, strength, etc., and exploring the production, manufacturing, and utilization of such materials.

PARTICIPATION:

Following awareness and demonstration activities, the students will collect, classify, and display texture rubbings of natural and synthetic materials.

RELATED ACTIVITIES

AWARENESS:

Research and discuss the role of technology in creating new materials and utilizations and improvement of existing materials.

DEMONSTRATION:

Visit the technology lab to view acquisition, storage, design, and utilization of natural and synthetic materials.

PARTICIPATION:

Locate and reproduce architectural symbols for natural and synthetic materials.

VOCABULARY:

Architecture

Construction

Manufacture

Materials

Natural

Simulate

Synthetic

PEOPLE AND PLACES:

Arata Isozaki

Louis Sullivan

Mies Van Der Rohe

TOPIC: Pictographs Communications

CONCEPT:

The ability to communicate utilizing a visual symbolic language is unique to the human species. Developing such a language has facilitated an efficient transfer of information directly, over distance, and even over time. Whether for religious or recording purposes, the representation of a concept by a single or multiple visual symbol is the most sophisticated of human communication processes. This sophistication is best illustrated by considering that our entire written language is created utilizing 26 basic visual symbols and our mathematics with a series of 10 numerically representational symbols. Initially direct pictographs attributed with religious or magical powers, our written language has continued to evolve. Today, with the development of computer language, a new literacy is required for those who will utilize such instruments; a literacy not unlike that of earlier periods of human history in which humankind can be divided into those individuals who have the ability to understand and utilize written language and those who do not have this ability.

This activity is designed to enlarge the student's awareness of the nature of symbolic communication; to illustrate the necessity for, and the sophistication of that type of communication; and in doing so, to increase the student's ability to utilize communication skills.

ACTIVITY:

Following discussion of the concept, note the various examples of symbolic communication within the classroom and discuss the various types and uses. Note especially those which utilize few or no words and discuss the ability to communicate such concepts. Examples may include signs indicating the location of exits and shelters and even the pictographs at restroom facilities. Select an activity or the function of some place or object (such as a drawing area) and assign the project of indicating the utility of that area utilizing only pictographs.

TRI-PLAN

OBJECTIVE:

To illustrate the necessity for, and the sophistication of, symbolic communication, and to increase the student's awareness and ability to utilize communication skills.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current visual communication applications within the student's environment.

DEMONSTRATION:

Exhibit and discuss early forms of symbolic communication such as pictographs and hieroglyphics and demonstrate their execution noting how some have evolved or were incorporated into our written language.

PARTICIPATION:

Following awareness and demonstration activities, assign the project of designing a pictograph to indicate an activity or function relative to the classroom.

RELATED ACTIVITIES

AWARENESS:

Exhibit and discuss international signs and symbols.

DEMONSTRATION:

Discuss and demonstrate morse code communication.

PARTICIPATION:

Learn and produce the braille symbols for the student's name or initials.

VOCABULARY:

Braille

Communication

Glyph

Hieroglyphics

Pictograph

Symbol

PEOPLE AND PLACES:

American Indians

China

Egypt

Paul Rand

TOPIC: "A Lasting Impression" Molds/Fossils Manufacturing

CONCEPT:

The "mold" is as old as nature itself as is evidenced by fossils recording the existence of various lifeforms. These fossils were created when various objects were covered by layer upon layer of mud and sediment over a long period of time, in conjunction with the tremendous pressure of the overlaying material. They gradually were transformed into rock. Within this rock can be found not only the preserved remains of plants and animals, but also the impression of their shapes in the solid rock. More recently this same process has been adapted by technology to re-produce items in nearly perfect detail from an original. As population and need have increased, this production method has been effective in providing goods in large numbers and in eliminating costly, time-consuming hand labor. While maintaining or even improving the quality of the original design, making objects available to the masses rather than only to individuals, the molding process is of technology's constantly re-creating processes.

This activity is designed to introduce the manufacturing technique of molding and show it to be relevant to past, present, and future.

ACTIVITY:

After discussion of the concept, identify items of mass production, which probably were created by the mold process. Continue the discussion by relating other items created in this method from jello to jewelry.

TRI-PLAN

OBJECTIVE:

To introduce the manufacturing technique of mold making and molding and exhibit its relevance to past, present, and future.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current applications of mold making within the student's environment.

DEMONSTRATION:

Collect, display, and discuss fossils and the natural forces and processes, which created them. Demonstrate the process of "making" a fossil by pressing a shell or natural object into clay, removing it to show its impression, and then filling the impression with plaster of paris to reproduce its image.

PARTICIPATION:

Following awareness and demonstration activities, student or students will execute the activity by creating molds of plastic or plaster material.

RELATED ACTIVITIES

AWARENESS:

Scavenger hunt for identical items in school boxes.
Manufactured by molding (erasers, pencil sharpeners, etc.)

DEMONSTRATION:

Visit the technology lab to view items reproduced by mold making and metal casting.

PARTICIPATION:

Attempt to reproduce or duplicate an item of student origin first manually and then by using the mold making process and casting a plaster of paris replica.

VOCABULARY:

Cast

Fossil

Mold

Pressure

Reproduce

PEOPLE AND PLACES:

Auto Manufacture

Dental

Liberty Bell

Natural History Museums

TOPIC: "A Picture's Worth A Thousand Words" Logo Communications

CONCEPT:

One of the more recent, and most sophisticated, uses of symbolic communication is the "corporate" logo. To represent the functions as well as the philosophies of an individual, institution, or business utilizing one visual symbol (often without other identification) requires communication of utmost clarity. This is often aided by exposing the public to the symbol utilizing an awareness or education process often approaching a level of saturation to achieve a conditioned response. Although the current logo is the product of an advanced development in design and awareness, the use of such a "signature" has many historical precedents. The most ancient of alphabets, Chinese and Japanese alphabet/word characters are examples of such communication. For ages in technology, manufacturers and artisans have left their signatures on their wares by the placement of a trademark.

This activity is intended to increase the student's communication awareness and skills by introducing and creating symbolic imagery.

ACTIVITY:

After discussing the concept, discover the application of trademarks and logos about the classroom on objects such as desks, utensils, and textbooks. Continue the discussion with a relation of consumer buying with the identification to product, producer, or need. Following such awareness activity, assign students the task of creating a visual symbol representing an individual, the class, an activity, or a product.

TRI-PLAN

OBJECTIVE:

To increase the student's communication awareness and skills by introducing and creating unique symbolic imagery.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current applications of logos within the student's environment.

DEMONSTRATION:

Collect, exhibit, and discuss various trademarks and logos noting the characteristics of the symbol and discussing how they may relate or reflect the function or philosophy of the owner.

PARTICIPATION:

Following awareness and demonstration activities, assign the project of identifying characteristics relative to self, of another object, and attempt to graphically represent them, refining the images into a single visual symbol.

RELATED ACTIVITIES

AWARENESS:

Identify a local designer or corporation and invite a representative to relate the concept relative to their experience.

DEMONSTRATION:

Research and relate the development of the schools mascot and logo.

PARTICIPATION:

Assemble a catalog of symbols by identifying, collecting, and displaying.

VOCABULARY:

Advertising

Design

Graphic

Image

Logo

Symbol

Trademark

PEOPLE AND PLACES:

Raymond Loewy

Paul Rand

Massimo and Lela Vignelli

TOPIC: "Get A Handle On It" Ergonomics Energy/Power

CONCEPT:

Tools are utilized to extend or amplify the capabilities of the humans who manipulate them. They transfer energy, transmit or transform the direction of energy, and direct the action of that energy. Tools, to be useful, must not only be efficient, but must also be efficiently used. The study of the relationship between human engineering and the efficient execution of tasks is known as ergonomics. This study has gained increased attention in recent years and tools produced as a result of such studies are more efficient, easier to manipulate, usable for extended periods, and even more aesthetic.

This activity will introduce the concept of ergonomics as a relation between the technological need for tools and the human ability to utilize those tools.

ACTIVITY:

After discussing the concept topic, display a variety of tools, which are hand-held. Identify them by specific use and also methods of manipulation. Continue the study by relating the required method of use with the ability of hands to control and utilize them, discussing their efficiency and ease of use.

Identify positive aspects such as the users ability to apply required pressures as well as negative aspects such as the need to grip with hands, fingers, or arms in awkward positions.

TRI-PLAN

OBJECTIVE:

To introduce the concept of ergonomics as a relation between the technological need for tools and the human ability to utilize those tools.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current applications of tools within the student's environment.

DEMONSTRATION:

Identify and demonstrate tools noting the position, energy expended, and skills required for manipulation.

PARTICIPATION:

Following awareness and demonstration activities, provide a student or students with a 9-inch section of wood dowel rod and an amount of clay sufficient to model a handle. The students will produce the handle by firmly squeezing the clay resulting in a shape, which conforms to their hand. After inserting the dowel in one end, compare their simulated screwdrivers to mass-produced items by noting handling capabilities and comfort.

RELATED ACTIVITIES

AWARENESS:

Exhibit charts displaying the range of human motion and relate to requirements within the classroom such as space per student, seat and desk size, and configuration.

DEMONSTRATION:

Visit the technology lab to view how large machinery relates to this concept.

PARTICIPATION:

Design a workspace based upon ergonomic study and utilize it for workshop activities.

VOCABULARY:

Efficiency

Energy

Ergonomics

PEOPLE AND PLACES:

Henry Dreyfuss

TOPIC: "Repeat That Please" The Photocopy Communication

CONCEPT:

We are, for the greater part, a society which communicates utilizing visual information. The need to deliver this visual information to growing audiences has increased at a rate almost equal to technology's ability to produce faster and more efficient methods of delivery. The printing press transformed our civilization from one in which information was possessed by few to one in which information was produced and received by many. The printed image, vastly improved in quality and production, continues to be a primary form of communication. Many methods are available for producing printed images, but few are as accessible and as cost effective as the photocopier. A product of 1930's technology, it has undergone rapid development in recent years leaving a once exclusive office domain to become a fixture found even in the grocery store. Because of its accessibility and familiarity, it is an ideal focal point for an introduction to the printed image and to printmaking.

This activity is designed to extend the student's awareness of visual graphic communication and of the technology which facilitates its continued effective use and future.

ACTIVITY:

Following discussion of the concept, identify examples of printed communication within the classroom. Continue by relating methods of printing to needs and other requirements for visual communication.

TRI-PLAN

OBJECTIVE:

To extend the student's awareness of visual graphic communication and of the technology which facilitates its continued effective use and future.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current applications of visual graphic communication within the student's environment.

DEMONSTRATION:

Discuss the technology of the photocopier and demonstrate its capabilities.

PARTICIPATION:

Following awareness and demonstration activities, introduce xerography as an art form used to create printed graphic images. Assign the students the project of assembling a collage utilizing photographs, paint, and other media. Make a print or edition of prints with the photocopier.

RELATED ACTIVITIES

AWARENESS:

Exhibit and discuss examples of xerographic art and the technique required to produce them.

DEMONSTRATION:

Invite the service/technician to demonstrate the construction and function of your machine.

PARTICIPATION:

Assign a student or students the project of creating an advertisement for a class or school function utilizing the photocopier for production and reproduction.

VOCABULARY:

Copy

Graphic

Reproduce

Visual Communication

Xerography

PEOPLE AND PLACES:

IBM

Xerox

TOPIC: "One After Another" Rube Goldberg Manufacturing

CONCEPT:

The society in which we exist and the technological system, which influences it, are based upon cause and effect relationships. For one activity to occur, another must precede it; for an object to be properly assembled, an order of assembly is required. The American cartoonist's, Rube Goldberg, career was an evaluation, if not a criticism, of a society so conditioned to the assembly line mentality. Both a parody of the cause and effect in society and a brilliant demonstration of his grasp of the concept, these illustrations are a delightful method of demonstrating cause and effect; its relativity to the technological process; and our responsibility and ability to control events.

This activity is designed to illustrate the cause and effect relationship in our society and to relate it to the methods of technology as well as our ability and responsibility to control them.

ACTIVITY:

Following a discussion of the concept, identify activities within the classroom, which depend upon cause and effect relationships. These may relate to other curriculum subject processes or activities dependent on schedules. Follow this

discussion by exhibiting Rube Goldberg illustrations and relating them to the cause and effect or sequential characteristics of the student's environment and life and the methodology of technology.

TRI-PLAN

OBJECTIVE:

To illustrate the cause and effect relationship in our society and to relate it to the methods of technology as well as our ability and responsibility to control them.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current applications of cause and effect situations within the student's environment.

DEMONSTRATION:

Exhibit and relate the sequential events as illustrated by Rube Goldberg.

PARTICIPATION:

Following awareness and demonstration activities, play the game "mousetrap".

RELATED ACTIVITIES

AWARENESS:

Describe cause and effect relationships in a day's activities and the ways they relate to students.

DEMONSTRATION:

Visit the technology lab and view the workings of simple machinery noting cause and effect relationships.

PARTICIPATION:

Invent your own Rube Goldberg illustrations depicting cause and effect relationships within the classroom and assign a student or students the project of assembly and demonstration.

VOCABULARY:

Assembly Line
Cause and Effect
Illustration
Parody
Sequence

PEOPLE AND PLACES:

Henry Ford
Rube Goldberg

TOPIC: Paper Alteration Construction

CONCEPT:

Technology is not only responsible for the creation of new materials, but also for the improvement in the composition and utilization of existing natural and synthetic materials. Many materials, physically or chemically altered, or combined with similar or dissimilar materials, acquire characteristics and properties often far beyond those originally possessed. Examples of such transformations include corrugated paperboard, plywood, tempered glass, steel, and reinforced concrete. Further technology is not only responsible for the development of such materials, but constantly re-evaluates and expands their utilization.

This activity will demonstrate the transformations in utility and strength of the student's most widely used material -- paper.

ACTIVITY:

After discussing the concept, note the variety of objects within the classroom composed entirely or partially of paper noting the manner in which the paper is utilized in its natural state or in conjunction with other materials. Continue the discussion by identifying the various ways paper enters, improves, or perhaps detracts from our lives. After discussing the properties of a

ACTIVITY:

single sheet of paper, referring to strength (opaque, transparent, surface, ability to take color, etc.) as well as weakness (susceptible to fire, water, tearing), demonstrate how the paper can be transformed by folding accordion fashion, rolling, or layering to increase its strength.

TRI-PLAN

OBJECTIVE:

To demonstrate the transformation in utility and strength of the students most widely used material -- paper.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current applications of paper within the student's environment.

DEMONSTRATION:

Discuss and demonstrate the properties of paper, in particular, its ability to support a load in following states: natural, folded in a variety of ways, layered by folding or gluing, and rolled.

PARTICIPATION:

Student or students will execute the activity after discussion. They will change the structure of paper to support at least twice as much as a flat sheet would support.

RELATED ACTIVITIES

AWARENESS:

Study, collect, and discuss various utilizations of paper within the student's environment.

DEMONSTRATION:

Discuss and demonstrate how a sheet of paper is formed (refer to enclosed support material).

PARTICIPATION:

Research the making of paper and report on historical, current, and future production and utilization of this material.

VOCABULARY:

Corrugated

Laminated

Layered

Natural Material

Paper

Pulp

Synthetic Material

PEOPLE AND PLACES:

?

Hand K.

paper

Before Paper

In Prehistoric days, people made their thoughts and ideas known to others with their voices. There were two disadvantages to this kind of communication. One was that their voices could be heard for only a short distance. The other was that there was no record of their words after the sound of their voices stopped. Messages passed along by word of mouth often became garbled, and were soon forgotten.

Cavemen discovered they could communicate with picture-writing by scratching their messages in sand or a smooth rock. Thus they recorded for history something of their way of life. On cave walls at Altamira in Spain, for example, you can see pictures of the prehistoric animals hunted by early cavemen in that region. Such picture-writing, however, could not be carried from place to place. This development came much later.

The ancient Egyptians are known to have begun a clever way of communicating. Seven thousand years ago they cut symbols in stone with sharp, pointed instruments. They learned to make bricks, and covered them with their picture-writing while the clay was still wet. They wrote in this way on the walls and pillars of their palaces, temples, and tombs. The picture-writing of the Egyptians is called hieroglyphics. Again, such picture-writing could not be carried from place to place. The ability to transport messages finally came when the Assyrians, who lived in Asia, started to inscribe messages on objects light enough to be transported, such as clay tablets, which were then baked hard. (From this practice we get our own word tablet for a pad of writing paper.) Also, around this time, people learned they could chisel messages on bark, cloth, or leaves. (From this we get the term leaf, meaning the page of a book.)

Papyrus

The search for a better material to write on continued. People investigated many materials. Finally, about four thousand years ago, the Egyptians made a great discovery about a plant called papyrus that grew along the banks of the Nile River. We get our word paper from the word papyrus.

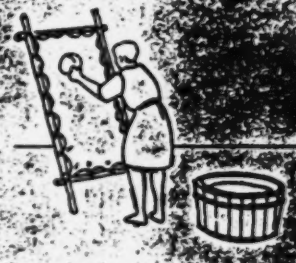
Papyrus has a pulp center, on which marks are easily made. The center stems of the papyrus reed were chosen because they were the broadest. They were cut lengthwise into strips. These strips were laid side by side until they formed a sheet of the desired width. A layer of shorter strips was then laid across them. Both layers were soaked in water and pressed together. The sheets were rolled or hammered flat and dried in the hot sun. The writing surface was smoothed by rubbing it with a stone or shell. When finished, the sheets were white or ivory colored. They were usually four to eighteen inches wide. (Any length could be made by adding one sheet to another.)

Papyrus was the most commonly used writing material in the world for more than twenty five hundred years. However, since Egypt was the only place papyrus could be obtained, only those countries close by could use it.

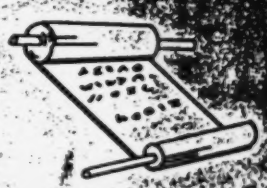
Parchment

By the second century B.C., a new kind of writing material, better than papyrus, was being made. It was called parchment after the kingdom of the same name in Asia Minor.

As the story goes, King Eumenes II of Pergamum, asked the Egyptian Pharaoh (king) for a large amount of papyrus so that he could start a library for his own people. The Pharaoh did not want another library to equal his own in Egypt, so he refused to sell papyrus to King Eumenes. Eumenes was not to be discouraged from developing a library so easily. He decided to use the skins of goats and sheep killed in the market. From that time on parchment was used for writing material.



Parchment was prepared by removing the hair or wool from the skin of an animal; for fine parchment the animals were usually young calves, kids, and lambs. Next the skin was place in lime water to rid it of its fat. The skin was then stretched on a frame and shaved with knives and scrapers. Powdered chalk was rubbed on with pumice stone to smooth and soften the skin.



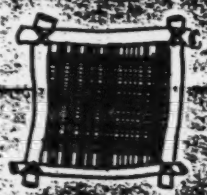
At first parchment was cut into long strips for inscription, then rolled into scrolls and tied. Later it was cut into sheets and bound into book form. It was tough and durable and took ink well, so the monks used it to make the early hand-lettered books.

The Beginning of Paper

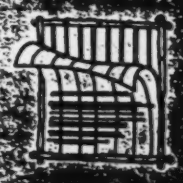
It was in China in the year 105 A.D. that "real" paper was invented. The actual invention is generally credited to a man named Ts'ai Lun, who was a government clerk for the Emperor.

In the early days Chinese scholars scratched their writings on strips of bamboo. The strips were then tied together in bundles and filed away. Later, Chinese scribes began painting in ink on strips of woven cloth, which were then rolled into scrolls or trimmed into sheets and bound into books. Ts'ai Lun found he could make a better material to write on out of the inner bark of the mulberry tree and some bamboo. Soon it was discovered that hemp, rags, and old worn-out fish nets made a smoother and stronger paper, so the mulberry bark and bamboo were not used. (Though sensational improvements have been made since, the key elements discovered at that time are still the basis of modern papermaking.)

To make the "real" paper, the first step was to chop the ingredients into bits. Then the material was soaked and cooked in order to break it down even more. Next it was pounded with a stone mortar or a heavy club. Finally, everything was cooked again until it became a pulp and rose to the surface, floating in a feathery layer.



In order to lift this floating layer from the vat and drain off the water, Ts'ai Lun invented the **mold**, the most important tool in papermaking. It is believed the first mold was simply a piece of woven cloth stretched between the sides of a square bamboo frame. The workmen dipped the frame into the vat and brought it up under the floating fibers. Lifting it out of the vat, they let the water drain away through the cloth. Then the mold, with its soggy coating of fibers, was placed in the sun until completely dry. Papermaking continued on a sheet-by-sheet basis for a long time.



The Paper Mold

The Chinese realized they needed a mold with a harder and smoother surface than the fabric mold. This would enable them to lift a sheet of paper before it was completely dry. The new mold had a row of parallel bamboo rods inside a bamboo frame to keep the mold covering from sagging. Instead of covering the mold with woven cloth, they used a mat made of bamboo and silk, that could be removed from the frame. Papermakers placed the mat on the frame and dipped the mold into the vat just as they did the woven-cloth mold. The difference was that after the water was drained out between the bamboo rods, they could stand the mold on its end and peel away the flexible mat, leaving the sheets of paper on top of a pile of similar sheets to continue drying. Papermakers finally lifted the moist sheets from the pile and pressed them against a wall or a wide board to finish drying.

A Secret Told

During the second century, the Chinese emperor decreed that the art of papermaking must remain a Chinese secret. Anyone revealing the methods used in making paper to a foreigner would be put to death. However, they could not keep the secret forever. About the year 750, the Chinese fought the Arabs in Central Asia and lost the battle. Among the captives taken by the Arabs were Chinese soldiers who knew the secret of making paper. Some samples of paper apparently had found their way into the Arab world, but not the know-how to produce it. It is quite likely some of the Chinese prisoners were able to save their lives by revealing the secret of papermaking to their Arab captors.

Paper was soon being made in Asia when the Chinese lost their battle, and by the year 793, the Arabs were also making paper in Bagdad. (Some of you may remember Bagdad as a city mentioned in the Arabian Nights, the home of Sinbad the Sailor.) For the next one thousand years, the art of papermaking spread through the rest of the world. By 1151, Spain was making paper. During the next three hundred years, papermaking spread through Europe, and in 1690 the art was brought to America.

From Rags to Riches

For hundreds of years, all paper was made by hand from rag pulp. In the early seventeen hundreds, most fabrics were still woven by handlooms, and as a result, cloth was so expensive that people wore their clothes as long as they held together. Housewives were urged to save all their rags for the paper mills. Rags became so valuable that the traveling peddlers were eager to exchange a set of bright, new tin cooking pots for a bundle of old rags. Nobody seemed to remember Ts'ai Lun's paper made out of mulberry bark. Finally, a Frenchman named Rene de Reaumur, a famous naturalist and physicist, suggested a new raw material to use in making pulp. His inspiration came from a rather astonishing source.

The French Connection

Reaumur had been observing the habits of the American Wasp, which chews wood obtained from trees and other wood objects into a paste. Out of this paste, the paper wasp builds its nest. The French scientist, upon examining the nest of the paper wasp closely, realized the insect had turned the wood into a pulp very much like that made by human papermakers. Reaumur wrote an article on the possibility of not using rags at all, but making paper out of wood. However, even though rags were scarce, it was 120 years before the papermakers paid much attention to Reaumur's discovery.

Faster, Faster

At the same time men were searching for a rag substitute, they were also trying to find a faster way to make paper. The hand-made paper mills could no longer fully supply the world's demand for more and more paper. In 1790, a machine was invented in Holland reducing the time necessary to break down the rags to fiber. A Frenchman, Nicholas Louis Robert, invented a machine in 1799 that produced paper in continuous rolls rather than in small batches. Although this machine was small and had to be cranked by hand, it was the forerunner to a modern paper machine that is as large as a city block in a paper mill today. In England, the Fourdrinier brothers financed improvements on the Robert machine. If a paper mill uses that machine today, it carries the Fourdrinier name and costs over $40,000,000. $40,000,000.

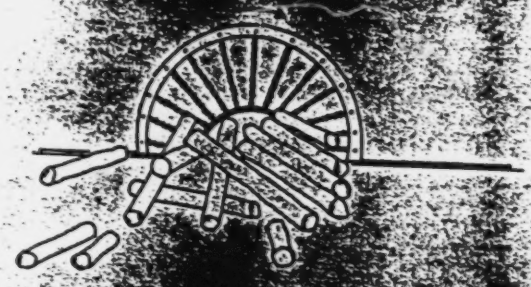
In 1840, a German, [illegible], invented a process and a machine to grind pieces of wood into pulp. This was a necessary step for the practical application of the principles Reaumur had discovered from the wasp.

A few years later, Englishmen and Americans contributed the major chemical discoveries for breaking down wood and making still better kinds of paper. Since that time, some of the most significant innovations in paper making have come from America, with scientists in both the United States and Canada contributing to make these two countries the biggest producers and users of paper in the world.

Papermaking Today

Modern papermaking begins in the forests. Ninety-seven percent of today's paper is made from wood pulp; the other 3 percent from a variety of other materials such as rags. Over thirty two million tons of paper are made from wood fibers each year. Of that, nine million tons come from waste paper which has been recycled.

A lot of wood is needed to make paper pulp. Today, people plant great forests of trees to give us wood for making paper. As trees are cut down, more trees are planted so that there will always be enough wood for making paper. [illegible] eight inches around are cut down, trimmed, and sawed into four or five foot lengths. The logs are then floated [illegible] to the pulp mill. In the pulp mill a machine strips [illegible]



Pulp Mill

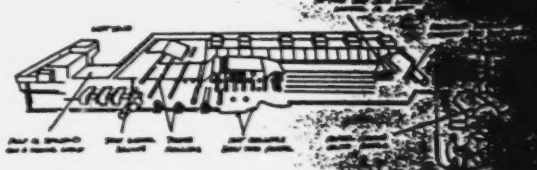
All wood is made up of two main parts: cellulose fibers, from which paper is made, and lignin, a sticky, gluelike material that binds together the fibers of the tree trunk. The cellulose fibers must be separated from the lignin so that they will become entangled with each other and can form sheets of paper.

There are two basic ways of freeing the fibers - mechanically and chemically. In mechanical pulping, a machine cuts the logs into tiny chips. The chips are cleaned, boiled, and dried, and called ground wood pulp. Ground wood pulp is cheaper to manufacture, but because the lignin has not been removed, it is weaker than chemically-made paper. Most newspaper is made from this kind of pulp. In chemical pulping, the lignin is separated and removed from the cellulose fibers. There are three main ways of doing this. (1) **The Sulphate Process** turns out kraft paper, a very strong paper. In fact, kraft is a German word meaning strong. (2) **The Sulphite Process** results in fine writing and printing paper as well as tissue and crepe paper. (3) **The Soda Process** produces paper for fine books and magazines. The wood for any of the three chemical processes is not ground; instead the logs are sliced into chips. The chips are then put into a digester, which works much like a pressure cooker. The digester is loaded with chips, several chemicals are poured into it, the lid is bolted down, and steam is forced inside at high pressures. The chips are cooked to separate the lignin from the cellulose fibers and turn into a thick, tarry, mass. The black pulp is fed into a series of three revolving drums covered with screening, where streams of water wash out the chemicals. In each drum, as the chemicals are washed away, the pulp turns lighter. Finally, the pulp passes over more drums where it is bleached and rewashed. After this last washing, the pulp is pure white and looks like fluffy popcorn.

Paper Mill

The pulp then goes to a paper mill. The mill is buildings often several blocks long filled with many machines, ending with the huge Fourdrinier. Usually the mill is built near a large lake, since enormous amounts of water are used in every papermaking operation. When the pulp arrives at the paper mill, it is mixed with water in a modern adaptation of the old Hollander machine invented by the Dutch. Sometimes dye for colored paper, is added here. Next, the pulp is pumped into the Fourdrinier where it is poured onto a moving wire mesh. Most of the water in the pulp drains out through the holes in the wire. As the pulp moves along, more water is squeezed out by rollers to make the fibers interlock more tightly. At the other end of the machine is a large roller called the "dandy." It transfers the wet sheet from the screen to the first series of felt rollers. These smooth the paper by evening the fibers. If the paper is to have a watermark, it is done at this time.

From the felt rollers, the long ribbon of paper is threaded between a series of steam-heated drying drums. The final operation is called calendering. The paper comes off the driers with a rough surface and is then pressed between the polished smooth rollers of the calender to take out any wrinkles. At long last, the paper emerges from the Fourdrinier and is wound into a loose roll. It is transferred to the rewinding machine where it is wound tightly. Sharp cutting wheels trim the edges and slit the roll to the exact widths requested by the mill's customers.



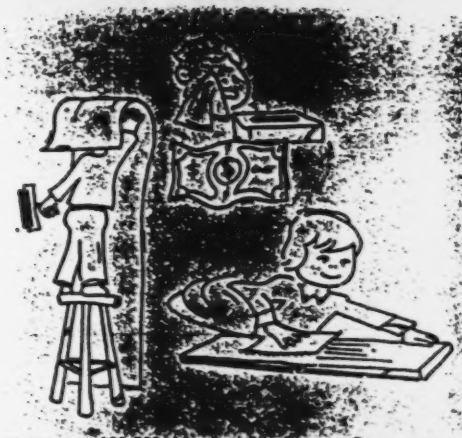
Watermarks

Watermarks are the designs seen on some paper when it is held up to the light. They are sometimes trademarks of the company making the paper. The watermark is put on the paper by pressing a metal design upon the wet sheet at the time it goes from the screen to the felt rollers.

Paper in Your Past and Your Future

Paper has been used to wrap fish, protect a space flier, line a battleship, bring home the bacon, crate machinery, buy a car, sell a house, blot out the sun or blot up spilled ink, report billions of dollars' worth of transactions on the stock market, and carry messages from the moon.

This versatile material also has been used for the writing of countless personal letters and for great literature of everlasting moment. It has been used for the creation of artistic masterpieces and recording the big and little events of history.



There are over 100,000 things made of paper. Soon we may be vacationing in paper cabins and even living in paper houses. We can now sit on paper chairs and eat at paper tables, as well as eat from paper plates. Paper clothes are already on the market and gaining in popularity. Disposable wearing apparel and paper bedding will be made available in hotels, motels, and at service stations, where people can "fill up" their wardrobe as well as the gasoline tank.

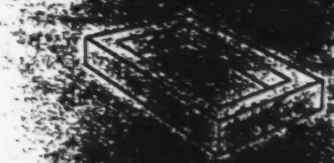
Quite naturally, not all paper products are made of the same kind of paper. To get some idea of what it means to have a material that can be used in so many ways, let's suppose one person could somehow buy or get samples of paper in at least one of its 100,000 uses. Suppose, too, that person could use just one paper item each day. To go through 100,000 items at that rate would take about 275 years. And at the end of the 275 years, you would find many more paper products would then be available for your use.

The paper industry is changing constantly. Each new use or new formula discovered seems to speed up the inventive process and lead to still more new uses. Others are the end result of complex inventions and chemical discoveries reached by long and patient research efforts. Neither course seems to have a limit.

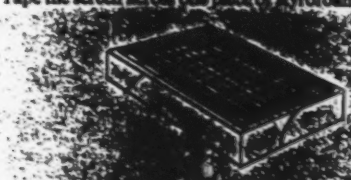
Let's Make Paper

- Glass jar with lid. An eight-ounce jar for instant coffee is the right size. If you have a plastic container about the same size, that will do.
- Six squares of toilet [illegible]. Each square has two layers, you need only three squares.
- Two pieces of styrofoam [illegible].
- One piece of window screen [illegible] inches. The screen can be copper, aluminum or plastic.
- Knife to cut the styrofoam.
- Blotter paper. Several [illegible] pieces. The thicker the better.

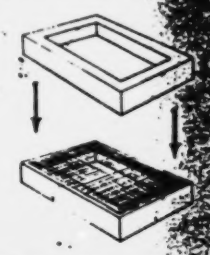
1. Cut a 3 x 5 inch [illegible] the center of each piece of styrofoam.



2. Tape the screen [illegible] piece of styrofoam.



3. Fill the glass jar about [illegible] full of water.
4. Pull the toilet tissue [illegible] into small pieces. Drop the pieces into the water in the jar and screw the lid on tight.
5. Shake the jar as hard and fast as you can until you no longer can see the pieces of toilet tissue.
6. Take off the lid and fill the jar with water to a little [illegible] three-quarters full.
7. Place the styrofoam rectangle without the screen on top of the one with the screen (the frame).



8. Pour the water from the jar onto the screen. Pour it [illegible]. Hold the deckle tightly against the screen so that the [illegible] will not splash out between the deckle and the frame. The water will pass through the screen while the [illegible] which were once toilet tissue, will be caught in a layer on the screen.
9. When all the water has drained through the screen, remove the deckle.

10. Press the blotter paper down firmly on the screen [illegible] fibers. This will flatten the layer and the blotter will [illegible] lot of water out. Blot the fibers until you have taken [illegible] much water as you can.
11. Lift the wet blotter from the fiber layer. Do this [illegible] and carefully.
12. Peel the wet fiber off the screen very carefully. You may [illegible] trouble getting an edge of the layer to come up from the screen. Work with your thumbnail or fingernail until [illegible] a little bit of the edge up from the screen. Then you can [illegible] the whole layer off.
13. Put the damp layer of fibers someplace where it will [illegible] make it dry quickly, put the layer of fibers between [illegible] pieces of dry cloth or newspaper and press it with [illegible] until dry. When the paper has dried completely it [illegible] able to write or draw on it.

For More Information

There are many exciting things that you can make [illegible]. Below are a list of books that will give you some ideas.

Exciting Things To Make With Paper; Look and Make [illegible]

1. Alkema, Chester. *Creative Paper Crafts*, New York: [illegible] Company, Inc., 1967.
2. Amidon, Eva. *Easy Quillery--Projects With Paper, Cord and [illegible]* York: William Morrow and Company, 1977.
3. Eisner, Vivienne and Weiss, Adelle. *The Newspaper Book*, [illegible] York: E.P. Dutton and Company, Inc., 1875.
4. Gibson, Walter B. *Fell's Guide to Papercraft, Tricks, Games [illegible]* New York: Frederick Fell, Inc., 1963.
5. Helfman, Harry C. *Origami*, New York: Platt and Munk, [illegible]
6. Lewis, Shari, and Oppenheimer, Lillian. *Folding Paper [illegible]* York: Stein and Day, 1962.
7. Sarasas, Claude. *The ABC's of Origami-Paper Folding for [illegible]* mont: Charles E. Tuttle Company, Inc., 1964.

•FIS•KITS•
FUN IN SCIENCE•

©PR Educational Consultants 1983

Center of Science and Industry
280 East Broad Street, Columbus, OH 43215
614/228-6362

TOPIC: "The Look, Smell, and Feel of Real Wood Construction

CONCEPT:

Wood is one of nature's own building products and one of the few, which is renewable. Easier to cut and shape than stone, yet possessing great strength combined with flexibility, it has been utilized since the dawn of history to create shelter and objects both useful and decorative. As a fuel/energy source, it is interesting to consider that its destruction is necessary for utilization. Although many substitutes for wood have been long in development and use, technology continues to provide new and varied methods of producing and utilizing wood and wood products.

The affection for the look and feel of wood continues and the technology, which once sought only to consume this resource is now directed toward its protection, improved production, and continued availability.

This activity is designed to acquaint the students with the nature of wood, its uses, and the necessity for its preservation and cultivation as a resource.

ACTIVITY:

Following discussion of the concept, note the variety of uses of wood within the classroom. Discuss the various characteristics of wood such as color, texture, strength, and flexibility, and how these differ in various wood varieties.

TRI-PLAN

OBJECTIVE:

To acquaint the students with the nature of wood, its uses, and the necessity for its preservation and cultivation as a resource.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current applications of wood within the student's environment.

DEMONSTRATION:

Collect, display, and discuss a variety of wood types noting their characteristics and explore historical and contemporary uses.

PARTICIPATION:

Following awareness and demonstration activities, discover, feel, smell (freshly cut wood), color, taste (sassafras tea), and experience other characteristics of a variety of woods.

RELATED ACTIVITIES

AWARENESS:

Discuss wood as a renewable resource and the responsibilities of insuring its availability.

DEMONSTRATION:

Visit the technology lab to view storage, design, and construction of wood and wood products.

PARTICIPATION:

Collect, classify, and display wood samples or texture rubbing, noting source, bark, leaves, etc.

VOCABULARY:

Bark

Deciduous

Hardwood

Renewable

Resource

Rings

Softwood

Texture

Variety

Wood

PEOPLE AND PLACES:

National Forestry Service

National Park Service

Theodore Roosevelt

TOPIC: "Tell Me Quick" Rapid Communication Communication

CONCEPT:

The ability to transmit visual information quickly and efficiently has been both a requirement of our technological society and the basis upon which it progresses and flourishes. Visual information is a primary medium for the transfer of information. A number of factors, however, have served to increase the difficulty of this transfer. The audience as well as the amount of information and the need to disseminate it have all increased. Conversely, delivery as well as reception time is often limited, perhaps by allotted time, attention span, the length of a newspaper column, or even the time available to communicate a billboard's message to the driver of a passing automobile. With such an increase in the need for information countered by a decrease in available time for transfer, it is necessary to extend the reception skills of the students to prepare them for their participation in this visual society.

This activity is designed to extend the student's awareness of the purpose and method of visual communication as well as its production and transfer and to extend their skills in receiving, processing, and utilizing information in a visual format.

ACTIVITY:

Following discussion of the concept, identify examples of printed communication within the classroom. Continue the study by identifying positive characteristics of communication in this form such as reproduction as well as the negative characteristics such as limited time and literacy problems.

TRI-PLAN

OBJECTIVE:

To extend the student's awareness of the purpose and method of visual communication as well as its production and transfer and to extend skills in receiving, processing, and utilizing information in visual format.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current applications of visual communication within the student's environment.

DEMONSTRATION:

Using flash cards, demonstrate the transmission and reception of visual information and the affects of time and material upon the successful transfer of this information.

PARTICIPATION:

Following awareness and demonstration activities, assign the project of producing visual images that may be efficiently transmitted under limited time conditions such as a series cartoon.

RELATED ACTIVITIES

AWARENESS:

Collect, display, and discuss a variety of magazine and newspaper advertisements noting images (written and photographic) design, color, and other communication devices.

DEMONSTRATION:

Demonstrate how factors such as image size, complexity, and color can affect information transfer.

PARTICIPATION:

Assign students the project to design and produce flash cards for classroom and curriculum use.

VOCABULARY:

Communication

Graphic

Transfer

Visual

PEOPLE AND PLACES:

Milton Glaser

Raymond Loewy

Paul Rand

TOPIC: "Around and Round" Bubbles and Spheres

Construction/Manufacturing

CONCEPT:

The bubble is a basic building block of life. A great portion of our environment, including the air we breathe, has as its basic element the bubble or sphere. Our planet and the sun around which it revolves are spheres formed by the forces of nature. Forces such as gravity and friction are patiently removing the corners and rough edges from our world. Nature is always economical in its efforts of creation, and technology, echoing nature, has begun to view the potential of the sphere in research and production. Architects have created huge bubbles for shelter and a primary space research project attempts to determine the possibility of producing the perfect sphere in the weightless environment of outer space.

This activity will focus on this most basic of shapes and relate it to our lives, our environment, and discuss technological efforts to improve both.

ACTIVITY:

Following discussion of the concept, note the variety of ways the bubble or sphere appears within the classroom and note the materials used to form them as well as their various uses. Continue the discussion relating the economy of the shape and its practical applications within technology; especially architecture.

TRI-PLAN

OBJECTIVE:

To focus on the sphere as the most basic of shapes and relate it to our lives, our environment, and to discuss the efforts of technology to improve both.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current applications of the sphere within the student's environment.

DEMONSTRATION:

Demonstrate how friction retards the movement of a load over a surface and how the placement of dowel rods or ball bearings will facilitate free movement.

PARTICIPATION:

Following awareness and demonstration activities, create blown soap bubble spheres, observe them free, how they will fill a space such as a cube, and how they join in multiples.

RELATED ACTIVITIES

AWARENESS:

Collect and display naturally occurring spheres (rocks in streams, seeds) and discuss the forces creating them or minimized by their shape.

DEMONSTRATION:

Demonstrate the free movement of a sphere through liquids compared to that of flat or multi-sided objects.

PARTICIPATION:

Collect and display spheroid objects, natural and synthetic, identifying methods of creation and use.

VOCABULARY:

Basic Shape

Bubble

Friction

Gravity

Pressure

Sphere

Surface Tension

PEOPLE AND PLACES:

R. Buckminster Fuller

NASA

Pontiac Silverdome

TOPIC: "We All Fall Down" Domino Constructions Manufacturing

CONCEPT:

The concept of cause and effect has long been a focus of attention for western science. This method of viewing the world around us is a convenient manner of classifying and explaining the interrelatedness of things. Technology, of course, utilizes cause and effect not to explain, but rather to produce. In many of the processes utilized by technology to create its products, interdependence is exhibited by the necessity for one item to be produced or installed before further production or assembly is possible. The development and incorporation of the assembly line by Henry Ford transformed not only automotive manufacture, but also the technology of manufacturing in its entirety. Today, the technology and production even of countries whose basic philosophies are not cause and effect based such as Japan are motivated and linked to the linear assembly line method.

This activity is designed to relate the interdependence of activities in today's technology and exhibit the importance of accurate planning and cooperation to such activities.

ACTIVITY:

Following discussion of the concept, identify activities within the classroom, which depend upon cause and effect relationships. These may be as complex as the working of the clock or as elementary as the necessity to complete work before participating in recess activities.

TRI-PLAN

OBJECTIVE:

To relate the interdependence of activities in today's technology and exhibit the importance of accurate planning and cooperation to such activities.

LEVELS

AWARENESS:

Introduction and discussion of the concept relating historical and current applications of the need for planning within the student's environment.

DEMONSTRATION:

Demonstrate the sequential assembly of a familiar object or following printed instructions, assemble a new item.

PARTICIPATION:

Following awareness and demonstration activities, assign students the task of organizing in groups to assemble a pattern of dominos standing on end, which when toppled will fall in a cause and effect relationship. Elevate the assignment by increasing the complexity of the pattern and demonstrating how premature disassembly can be avoided by delaying the insertion of intermittent dominos or by the insertion of blocking objects, which are removed only prior to disassembly.

RELATED ACTIVITIES

AWARENESS:

View videotape recordings of assembly line procedure.

DEMONSTRATION:

Visit the technology lab to view disassembly (assembly technique).

PARTICIPATION:

Disassemble and reassemble a simple familiar object.

VOCABULARY:

Assembly Line

Cause & Effect

Sequential

Relationship

PEOPLE AND PLACES:

Henry Ford

APPENDIX B

Taxonomy Classified
High School Curriculum Material

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Communication Technology

Unit Title: Communication Network
Taxonomy Reference: 1. Introduction to Communication Networks

Lesson 1 of 8

BACKGROUND:

This activity will help students apply what they have learned from the lesson about the five elements (according to the Industrial Technology Systems Handbook) of communication networks. These elements include: 1. message, 2. audience identification, 3. selection of medium, 4. production, and 5. presentation. The element: message, refers to the question: What does one wish to communicate?; audience identification, refers to the questions: What audience does one wish to direct his communication?; selection of medium, refers to the question: What is the best means available through which one can communicate to the target audience?; production, refers to the question: What is the most efficient and economical method of creating and reproducing the message?; presentation, refers to the question: How effectively did the communication achieve its goal? (i.e. did profits rise this quarter because of our advertising campaign?). This activity will also help the students realize the difficulty in communicating without the "tools" of communication. Lecture material given earlier will have introduced the five elements of communication networks, their importance in the communication model and everyday life.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Demonstrate what communication involves without those tools commonly associated with communication.
b. Write a paragraph of at least eight sentences (60 words) depicting the methods used by primitive people in communication.

INTRODUCTION:

We need to become more aware of the problems in communicating that motivated early civilizations to develop tools for communicating. The activity that follows should help each student to create a communications awareness. You will divide up into groups of two for this activity. The first thing each group must do is to agree on a message you want to communicate to the class. Keep the message as

INTRODUCTION: (Continued)

simple as possible. When each group has decided upon its message, the instructor will copy the message down along with the names of the students in the group. Each group has the following restrictions in communicating their message: 1. No speaking, and 2. No writing.

Also, the following questions (if applicable) should be communicated: 1. What? 2. Where? 3. Who? 4. When? 5. Why? 6. How?

ACTIVITY QUESTIONS:

1. What was the message you tried to convey?
2. Did others in the class understand you?
3. Identify your audience.
4. With what medium did you choose to communicate? (i.e. body language, gestures, pantomime, charades, etc.)
5. Describe step by step exactly what you did in front of the class to communicate your message.
6. Do you think you could enact precisely what you did earlier and still get the same results?
7. Would what you did in front of class be a feasible presentation method for other message? Explain.

ACTIVITY:

1. Break class up into groups of two students each.
2. Allow 10 minutes for each group to decide on a simple message to be communicated to class.
3. Instructor should copy messages from each group and names of students in group.
4. Group presentations should take no more than three minutes each.
5. Activity questions can be used for class discussion or for graded student evaluation.

EQUIPMENT AND SUPPLIES:

Teacher: paper, pen

Students: paper, pen

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Communication Technology

Unit Title: Communication Network
Taxonomy Reference: 1. Introduction to Communication Networks

Lesson 2 of 8

BACKGROUND:

This activity will help students apply what they have learned from the lesson about the uses of communication networks according to the Industrial Technology Systems Handbook. These uses or purposes of communication networks include: 1. transferring information, 2. influencing opinion, and 3. entertaining. The purpose: transferring information, refers primarily to communications that transfer information (i.e. textbooks). The purpose: influencing opinion, refers primarily to communications that attempt to change one's opinion (i.e. advertisements, political posters, etc.). The purpose: entertaining, refers primarily to communications that attempt to entertain (i.e. movies, videos, novels, etc.). One must understand that though these purposes are primary goals, generally speaking each communication contains elements of each purpose--that no communication achieves 100% "purity" based on its purpose.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Discuss accurately the purposes for which communication networks are applied.
b. Choose examples accurately of messages indicating uses of communication networks.

INTRODUCTION:

Having had the lecture on uses of communication networks, it is time to apply what we have learned. First, the instructor can prepare three place cards 10.5" x 13", each with a clearly, understandable example of the three kinds of communication networks. Second, the instructor will ask each of the students to prepare one example of each kind of message. These examples should be obtained from several media sources (i.e. newspapers, television, magazines, books, circulars, etc.). Also, for ease of presentation and discussion, the examples should be rubber cemented to poster board or other substantial material.

ACTIVITY:

1. Each student is to bring in three messages--one each of the following:
   a. transferring information
   b. influencing opinion
   c. entertaining

As students look for messages, they should use at least three media sources (i.e. magazines, newspapers, advertisements, books, television, etc.). If students use a media such as television, books, or other sources that do not provide a hard copy, have the student write a synopsis of the communication and decide under which category it comes.

2. Break class into three groups and have each group responsible for selecting the message that best represents one use of communication networks. Give each group a name of the purpose for which they are responsible. Example: group 1 would be called: Transferring information; group 2 would be called: Influencing opinion; and group 3 would be called: Entertaining.
3. If the students have not already rubber cemented their examples, have them do so now.
4. Present finished examples to the class for discussion and critiquing.

EQUIPMENT AND SUPPLIES:

Teacher:

Three prepared examples, one each of transferring information, influencing opinion, and entertaining. Have these rubber cemented onto poster board for ease of display.
Rubber cement (enough for three more mountings)
Three 10.5" x 13" sheets of poster board for student selections.

Students:

Examples from several media sources.

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Communication Technology

Unit Title: Communication Network
Taxonomy Reference: 2. Defining the Message

Lesson 3 of 8

BACKGROUND:

This activity will help students apply what they have gleaned from the lesson about the elements of the design process and how the elements can be implemented for use in this activity. These elements of the design process are: 1. identify problem, 2. analyze, 3. define, 4. brainstorm, 5. select, 6. implement, and 7. evaluate.

Identification of the problem is basically a succinct statement of the problem. Analyzation of the problem helps one to understand the aspects of the problem. A definition of the problem will help one in achieving a specific solution; therefore, the definition must consist of a specific or main element one wishes to correct via a solution. Brainstorming is simply a list of every idea for solution one can possibly imagine. The key here is not to limit oneself, but rather to feel free to think of anything and everything. Selection of the ideas from the above brainstorming is based upon personal taste and how well you feel you can communicate your ideas. Since you are not limited by actual manufacturing processes, you can choose any idea as long as your intended design satisfies the problem. Implementation involves a fine tuning of the tentative design selection. In order to implement an idea or design, one must see how the idea looks on paper.

You may decide that the idea you wanted earlier is not what you want now. This implementation step is closely associated with evaluation. Try several ideas and sketch how they may look on 8 1/2 x 11 inch paper. Evaluate your results, and upon such evaluation make your final selection.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Write the seven elements of the design process and a brief (14 word) description of each element.
b. Apply the elements of the design process to his/her own advertisement problem, and create a solution.
c. State clearly how problems can be identified.
d. Define what the word "message" means.

INTRODUCTION:

Before we can proceed much further about communication, we must decide what the word message means. From what we have experienced earlier, a message can be an oral, written, or electromagnetically-produced communication that has as its purpose one of the following:

1. Transferring information,
2. Influencing opinion, or
3. Entertaining.

In order for us to proceed smoothly to the message we want, each student needs to follow this sequence of steps:

1. Identify problem,
2. Analyze,
3. Define,
4. Brainstorm,
5. Select,
6. Implement, and
7. Evaluate.

Each of us live so closely associated with everyday problems that we may have a difficult time in recognizing just what a problem may be. A problem could be the irritation we feel when our pen runs out of ink during an important lecture or examination. Another problem could be as far reaching as how to obtain money legally for that new outfit or used car. Whatever we see in our lives as an irritation can usually be identified as a problem. For instance, in reference to the pen running out of ink at a crucial time, could be analyzed in this way: "Is there a way in which the ink reservoir could be made large enough to hold enough ink for five years of writing?" Notice that this questions asks important information, but it does not really get at the heart of the problem because the pen designed to write for five years will eventually run out of ink some time during the fifth year of use. Some more questions that we can ask that will help us use our imagination follow: "Is there some way in which ink is not used at all, but some well-defined magnetic field that can scribe figures onto a special light-weight tablet or paper?" This question helps us to probe the unknown and to derive for ourselves the endless possibilities that eventually may be feasible a few years hence.

The idea about analyzing is to ask your questions about how to overcome the problem, even if at this time it is not feasible to construct such a device.

In defining the problem, you will try to determine the essential parts of the problem--the important aspects of a problem. One must make a decision about what one believes to be the main aspect of the problem. This helps to zero in on a specific solution.

INTRODUCTION: (Continued)

In brainstorming, one must generate as many solutions to the problem or specific aspect of the problem as possible. This includes everything one can think of--including those ideas that seem ridiculous or improbable. Do not restrict yourself during this time, be creative and imaginative. The sky is the limit.

In selecting an idea from those listed, the selection process is based primarily on what you as a designer would like to produce. Since this is no manufacturing class, your solution can be something entirely Science Fiction. Who knows, it may just be a reality in the very near future. Even the most far-out ideas are acceptable in this class because you will create an advertisement based on selection of your ideas. The idea does not really have to work or even exist in order for your to create an advertisement, however, if an object, about which the student makes his/her advertisement, does not exist the student will have to do the artwork entirely by hand.

During the implementation of the idea, the thrust is to play around with the arrangement of shapes on an 8 1/2 x 11 inch sheet of paper. You may decide that the idea you thought you would like to work with is not the one you really like. This is where evaluation comes in. You may want to play around with several ideas, sketch probable arrangements, evaluate each, and then decide upon which you really want to develop. Remember, some ideas will require more artwork on your part than other ideas you have listed.

ACTIVITY QUESTIONS:

1. Write the seven elements of the design process and a brief description of each element.
2. How did the design process help you in coming to a solution?
3. Write three or four sentences describing how problems can be identified.
4. What is communication?

ACTIVITY:

1. Give students time enough to decide on a problem they make like to address.
2. Have students work individually. If students work in groups, they still should decide on a problem of their own. However, group members may help with the concepts of application of each design step.
3. The students should then do the best of their ability, identify a specific problem in a manner congruent with what was spoken earlier.
4. The students next should analyze their problem.
5. The students should define a specific attribute of their problem they wish to solve.

ACTIVITY: (Continued)

6. The students should next brainstorm no less than 12 ideas that could be used as solutions.
7. The student should select from the ideas above which they think will work the best as a solution.
8. The student should implement this selected idea by sketching it on paper. Also write ramifications about the design and whether he/she really feels it is what they want.
9. The student should evaluate the above proposal. Decide whether it meets with your approval and artistic abilities.
10. This activity can be given as homework or an in-class activity not to exceed two 50-minutes classes for completion.

EQUIPMENT AND SUPPLIES:

Teacher:
Supply of bond paper for students thumbnail sketches.

Students:
Paper
Writing instruments

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Communication Technology

Unit Title: Communication Network
Taxonomy Reference: 3. Audience Identification

Lesson 4 of 8

BACKGROUND:

In this activity and the ones to follow, each student will represent a corporation or company of his choice. This corporation may be one in existence or may be entirely imaginary. After deciding on what kind of corporation each student wants to represent, they should decide on a product or service they would like to market. Some of the more creative students may even want to tackle the challenge of marketing a service. After each student articulates the product or service, they would like to market; have them write down in a paragraph of about eight sentences the problem their product or service satisfies. This may be more easily explained if you, the teacher, claim that products and services are created to eliminate problems. Have the students define what the problem(s) may be in relation to the product or service they have chosen to market.

Using the school population, have the students collect demographic data about the need of their product among school-aged peers.

The collection of data should be done on students own time. Allow about a week for each student to have a chance to query his/her peers. This can be accomplished with some sort of survey. For instance, if one were to market a pen, the following survey is a viable example:

SURVEY ON WRITING INSTRUMENT DESIGN

Directions for filling out this survey: Place a check mark by the most appropriate response. Y=yes, N=no.

1. Which do you use more?
   - ____ a. a wooden pencil
   - ____ b. a mechanical pencil
   - ____ c. a pen (other than a fountain pen)
   - ____ d. a fountain pen
2. Which would you prefer?
   - ____ a. metal housing
   - ____ b. plastic housing
   - ____ c. other _____
3. In reference to pens, which do you prefer?
   - ____ a. ball points
   - ____ b. felt points
4. The action or mechanism button used to expose the writing point would be located where for greatest convenience?
   - ____ a. top
   - ____ b. side near clip
   - ____ c. side near forefinger
   - ____ d. side near thumb
5. Which would you prefer?
   - ____ a. an opaque housing
   - ____ b. a clear housing
6. In reference to mechanical pens and pencils, which action (that which enables you to expose the writing point) would you prefer?
   - ____ a. a twist action
   - ____ b. a click action
7. Would you prefer caps? ____ Y N____

8. Would you prefer shirt pocket clips? ____ Y N ____

9. Would you prefer writing instruments in matched sets?

____ Y N ____

10. What media do you most often use?

____ a. television

____ b. radio

____ c. newspaper

____ d. magazines

BACKGROUND: (Continued)

A survey limited to about ten well-stated questions should suffice to indicate to the student how he/she ought to design his/her product/service.

Next, have the students analyze their surveys (not more than ten surveys) and summarize their findings either in written and/or pictorial form. Then have the students compare their final design to that of the definition of their problem to see whether the final design still satisfies the elements of the problem.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Define demography.
b. Prepare a concise survey of no more than ten questions related directly to their product or service.
c. Summarize the survey findings.
d. Represent their final product or service in written or pictorial form.

INTRODUCTION:

This activity will help students apply what they have gained from the lesson about audience identification (according to the Industrial Technology Systems Handbook). Included under the topic of audience identification are: 1. collecting demographic data and 2. comparing audience to identified problem. Demographic data could be defined as information relating to an identified problem from a particular social group or population of people. In comparing the audience to an identified problem, one simply creates a summary of the results obtained (tally of a survey).

ACTIVITY QUESTIONS:

1. Define demography.
2. Explain your school population in terms of a demography.
3. What are the characteristics of a concise survey question?
4. Within a paragraph of eight sentences, describe the findings of your survey.

ACTIVITY:

In this activity, have the students list the media that are available for communication. Of that list, have the students check off the media most probably used by identified audience. This may be a part of their initial survey. By asking a question that states: "What media do you most often use?", the students will have a good idea what to record on the chart. Next, the students should check off the media they consider most effective for the message about their product or service.

1. Utilizing the solution from the previous activity, create a survey that questions your peers about what they like or do not like in general about the product or service you have chosen.
2. Create ten copies of this survey.
3. Fill in the survey yourself or allow your friends to do it themselves (as long as you are certain they will not misplace your survey).
4. Compile the results of the survey in written or pictorial form, whichever you prefer. Remember to take seriously the information provided by the survey, but remember also you are the creator and have final say.

EQUIPMENT AND SUPPLIES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Communication Technology

Unit Title: Communication Network
Taxonomy Reference: 4. Selection of Medium

Lesson 5 of 8

BACKGROUND:

This activity will help the students reinforce what they gathered from the lesson about media. A fairly complete list of media may look like the following:

1. television
2. video
3. radio
4. tabloids
5. posters
6. memos
7. newspapers
8. magazines
9. book
10. paintings*
11. sculpture*
12. satellite
13. graphs, maps, and charts
14. jewelry*
15. billboards
16. architecture*
17. fashion*
18. music

*The communication occurring when one employs these media may not be readily understood by the general public, yet these same media can be used for some kind of communication regardless of the degree to which the message is communicated.

This list is easily divided into two classes. The first class consists of those media whose message is readily understood within the culture in which the communication occurs, basically because the native language is used. The second class would include those media that communicate no less than those that use the native language of a culture, but communicate through the use of form and material. The purpose of such is to communicate a personal sentiment to the viewer not necessarily the same sentiment to each viewer.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Analyze the available media and select the most appropriate one to solve their problem.

INTRODUCTION:

This activity will help students apply what they have gained from the lesson about selection of medium (according to the Industrial Technology Systems Handbook). Included under the topic of selection medium are: 1. what media are available, 2. media most used by identified audience, and 3. most effective medium for message.

ACTIVITY QUESTIONS:

1. State your advertising problem.
2. What medium did you choose to solve above problem?
3. Why did you choose this medium? What do you think its advantages are over other media?
4. Do you think you will feel comfortable working in this medium?

ACTIVITY:

Each student will create a chart upon which to place the preferences of their audience. One column will be a list of media choices within the scope of the classroom setting. There will also be ten other columns each designated with a student's name. These named columns represent the students who filled out a corresponding survey. Each column should have at least one mark that corresponds to media most often used by that individual. Your chart should look like the following:

Check the medium most used according to response on survey.

	STUDENT NAME																		
1. television																			
2. video																			
3. radio																			
4. tabloid																			
5. posters																			
6. memos																			
7. newspapers																			
8. magazines																			
9. books																			
10. paintings																			
11. sculpture																			
12. satellite																			
13. graphs, maps, and charts																			
14. jewelry																			
15. billboards																			
16. architecture																			
17. fashion																			
18. music																			
19.																			
20.																			

ACTIVITY: (Continued)

In an additional or unused column, mark the media of your choice that you think best suits the solution of your problem. You may choose more than one if you really have trouble deciding. Next add up the number of marks each medium received. The medium receiving the most marks ought to be the medium you use to address the solution of your problem as long as the choice is within the scope of the classroom and course. If there is a tie between two ore more media, then you must decide which medium should be used based upon the merits of each medium.

EQUIPMENT AND SUPPLIES:

Teacher:

Student:

- Surveys or summary from last activity.
- Paper
- Straight edge
- Writing instrument

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Communication Technology

Unit Title: Communication Network
Taxonomy Reference: 5. Establishing and Managing a Company

Lesson 6 of 8

BACKGROUND:

The printing industry, one among many graphic communication industries, is one of the few industries that continues to experience economic growth. To understand a little more about how companies survive fierce competition within this industry, each of you will establish your own company. Each of you will be given a fixed amount of capital. With this capital, you must procure the materials necessary for your advertisement. Some of you will quickly find that planning becomes essential if you are to continue operating in the black. The capital given to each of you will be just what you need to complete your solution, but few may still be operational at the end of the unit.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Form small companies.
b. Write a brief paper (750 words) about the generation of capital in a corporation.
c. Procure materials by writing checks.
d. Keep accurate financial records.

INTRODUCTION:

This activity will help students apply what they have gained from the lesson about establishing and managing a company (according to the Industrial Technology Systems Handbook). Included under the topic of establishing and managing a company are: 1. generation capital, 2. employee personnel, 3. train personnel, 4. obtain and set-up equipment, 5. procure materials, and 6. maintain financial and personnel records. Many of the essential facets of establishing and maintaining a company come together in this activity to create an awareness within the student of the details and responsibilities of management.

ACTIVITY QUESTIONS:

1. What graphic reproduction process did you decide to use? Why?
2. How much waste did you generate? Why or why not?
3. In your own estimation, would you say that your planning was adequate? Why or why not?
4. Are you still operating in the black? Do you still have money in the bank with all bills paid?
5. If you are operating in the red, why do you think that occurred? What would you do differently?

ACTIVITY:

In this activity, each corporation (student) will be awarded capital enough to complete several processes for some type of advertisement. This ought to follow some lecture on how capital is normally generated, i.e. by the sale of stocks and bonds. Each company will be awarded stocks, in turn they can sell these stocks to the Wealthy Bank of America. No money exchanges hands, but the face value of the stocks they sell to the bank is tallied and credited to that company's account. With this credit the company can purchase materials by writing checks against its credit. With these purchased materials, the company is to complete an advertisement of the product or service decided upon. As with any company, a number of examples ought to be made using different media such as:

1.
2. lithographic
3. halftone
4. screen printing
5. computer generated (if available)
   a. dot matrix
   b. laser jet
6. xerographic

From these samples, the advertisement that most flatters the characteristics of the product or service will be chosen for classroom publication or even in the school newspaper (with appropriate disclaimers of course).

Even though students may fall in the red, they must continue to purchase materials and complete their project.

EQUIPMENT AND SUPPLIES:

Teacher:

Preprinted ledger	500 sheets
Preprinted checks	500 sheets
Preprinted timecard	500 sheets
Preprinted stocks	500 sheets

EQUIPMENT AND SUPPLIES: (Continued)

Students:

Notebook (to act as account book or ledger)
Writing instrument

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Communication Technology

Unit Title: Communication Network
Taxonomy Reference: 6. Production

Lesson 7 of 8

BACKGROUND:

Production is nothing more than planning. Planning that has as its purpose a final product. In order to achieve this final product, a sequence of carefully orchestrated steps ought to be followed. if these time-proven steps are not adhered to, a company stands a good risk of losing sufficient funds through waste of material and time.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Synthesize basic principles of graphic design by employing each in his/her artwork.
b. Plan his/her artwork with the proper use of thumbnails, comprehensive layouts and paste-ups.
c. Assemble his/her image with the proper use of one or more of the following: photographic techniques, computer, and hand-assembled images.
d. Correctly create a photo conversion through one or more of the following processes: photogram, contact printing, PMT, orthochromatic, panchromatic film, and half tones.
e. Transfer his/her image correctly by one or more of the following methods: photo offset lithography, screen printing.
f. Employ correct finishing procedures.

INTRODUCTION:

This activity will help students apply what they have gained from the lesson about production (according to the Industrial Technology Systems Handbook). Included under the topic of production are: 1. message design, 2. message assembly, 3. message conversion, 4. message transfer, and 5. editing and storing. All of these elements come together and form what is commonly called production. Even though the final product is often referred to as a "production run", there has been much "behind-the-scenes" planning in order to create the final product. What this activity attempts to do is to create within each student a sense of the involved planning necessary to create a viable finished product.

ACTIVITY QUESTIONS:

1. How much time did you spend in each of the planning steps? (i.e. design, assembly, conversion, transfer, and finishing).
2. According to your production schedule, are you ahead or behind? Why?
3. Have you remembered to keep track of all your expenditures? Does your checkbook balance?

ACTIVITY:

In this activity, the companies (students) will be in the actual process of creating their advertisements. There is a procedure, however, that should be followed so as to reduce expenditures and allow all companies to remain in the black by the end of the grading period.

It would be a big help to your students if there is a computer* available for their use at this time. Even if all the artwork can not be generated as such, at least a part of the advertisement (generally the text) can be computer generated. Those school systems that yet, do not have computers may be limited to hand-set type methods or dry-transfer methods. The following is at outline of the procedure that should be implemented when creating the advertisements.

I. Artwork (Message Design)
   - A. Basic Principles of Graphic Design
     1. proportion
     2. balance
        - a. formal
        - b. informal
     3. contrast
     4. harmony
     5. unity
     6. rhythm
   - B. Planning of Artwork
     1. thumbnails
     2. comprehensive layout
     3. paste-up
        - a. illustration
        - b. tissue or acetate overlay

II. Image Assembly (Message Assembly)
   - A. Photographic Image Assembly
   - B. Computer Generated Image Assembly
   - C. Hand-Assembled Images
     1. hand-set type
     2. dry-transfer

III. Photo Conversion (Message Conversion)
   - A. Photogram
   - B. Contact Printing
   - C. Photomechanical Transfer
   - D. Orthochromatic Film
   - E. Panchromatic Film
   - F. Halftones

ACTIVITY: (Continued)

IV. Image Transfer (Message Transfer)
- A. Photo-Offset Lithography
- B. Paper
- C. Inks

V. Finishing Procedures
- A. Cutting
- B. Perforating
- C. Folding
- D. Drilling and Punching
- E. Collating
- F. Jogging
- G. Padding and Gluing
- H. Stapling and Stitching
- I. Embosing
- J. Sheet Fastening
  1. saddle wire stitching
  2. side wire stitching
  3. soft sewn
  4. sewn case finishing
  5. perfect fastening
  6. post
  7. ring
  8. plastic comb
  9. spiral

EQUIPMENT AND SUPPLIES:

Teacher:
- Well-furnished lab
- AB Dick 360 various color litho presses
- Multigraphic 1360 two-color screen printing material
- Process camera
- Paper supply
- Paper cutter hydraulic
- Jogger
- Thermographic powder

Students:
- Writing instrument
- Ledger
- Design ideas
- Ready for planning

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Communication Technology

Unit Title: Communication Network
Taxonomy Reference: 7. Presentation

Lesson 8 of 8

BACKGROUND:

A static or unchanging final product soon looses its appeal. The target audience become more interested in products that advance with time. if a product remains unchanged, it soon becomes out moded, an "antique" so-to-speak. Society is built on progress--progress involves change. If products do not change with the times, they are soon forgotten. To avoid this disaster, implementation of a network or presentation to the public of your product is needed. In addition to this presentation, the company needs to receive consumer comments or feedback as to the improvement of your product. Upon careful analysis of the comments, studies of retooling modifications in your product may be feasible. Keep in mind, however, that modification of your product really has nothing to do with the procedures acquired through these activities. You may, however, have to alter some design work for further advertisement production.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Present their final advertisement through a medium that best suits target audience.
b. Submit their final advertisement for publication in a classroom or school newspaper (with appropriate disclaimers).
c. Claim with supporting evidence the communication network utilized in their advertisement.
d. Describe briefly (250 words) how to implement a modification of the advertisement.

INTRODUCTION:

This activity will help students apply what they have gained from the lesson about presentation (according to the Industrial Technology Systems Handbook). Included under the topic of presentation are: 1. implementation of network, 2. feedback from network, and 3. modification. Each of these elements are a part of the concept of presentation. Often times we think of a lecture as a presentation in itself.

INTRODUCTION: (Continued)

Yet, there is more to presentation than just the giving of information to another part. We must wait for that party to synthesize such information and accept their response as an invitation for new insight and/or modification of existing principles or theories. What does this have to do with our advertisements? Your advertisements, not doubt, are very well done. However, there may be a simple added touch needed to make it better. Better is what counts in the competitive world of advertising. You need to be flexible enough to modify your design to suit interests of target audience.

ACTIVITY QUESTIONS:

1. Are you operating in the black? or the red? Why or why not?
2. How have these activities helped you?
3. How have these activities hindered you?
4. Identify, with supporting evidence, the communication network your advertisement exemplifies.
5. Describe briefly (250 words) how you would implement a modification of your advertisement.

ACTIVITY:

In this activity, the companies (students) must submit their final advertisement in that medium that best suits its need; and present to the class with a 3-5 page typed report indicating the detailed steps in the production of their chosen advertisement along with complete financial records.

EQUIPMENT AND SUPPLIES:

Teacher:

Students:

- Reports
- Final product
- Final product as may appear in publication
- Financial records
- Writing instrument

Time Card

Date	Monday		Tuesday		Wednesday		Thursday		Friday	
	Hrs.	Min	Hrs.	Min	Hrs.	Min	Hrs.	Min	Hrs.	Min
Ending Clock Time:										
Starting Clock Time:										
Total										
Date										
Ending Clock Time:										
Starting Clock Time:										
Total										
Date										
Ending Clock Time:										
Starting Clock Time:										
Total										
Date										
Ending Clock Time:										
Starting Clock Time:										
Total										
Date										
Ending Clock Time:										
Starting Clock Time:										
Total										
Date										
Ending Clock Time:										
Starting Clock Time:										
Total										
Date										
Ending Clock Time:										
Starting Clock Time:										
Total										
Date										
Ending Clock Time:										
Starting Clock Time:										
Total										

Remember to divide the clock minutes by 0.6 to obtain hundredths of hours.
example: 15/0.6=25

Name _____
Date _____
Check # _____
Paid To _____
_____
Amount $
_____

Corporation Name _____ **No.** _____

_____ **19** ___

Pay to the Order of _____ **$** _____

_____ **Dollars**

Wealthy Bank Of America

Memo _____ _____

⑈045000033⑈ 1 8237821004 3⑈ 0989

Name _____
Date _____
Check # _____
Paid To _____
_____
Amount $
_____

Corporation Name _____ **No.** _____

_____ **19** ___

Pay to the Order of _____ **$** _____

_____ **Dollars**

Wealthy Bank Of America

Memo _____ _____

⑈045000033⑈ 1 8237821004 3⑈ 0989

Name _____
Date _____
Check # _____
Paid To _____
_____
Amount $
_____

Corporation Name _____ **No.** _____

_____ **19** ___

Pay to the Order of _____ **$** _____

_____ **Dollars**

Wealthy Bank Of America

Memo _____ _____

⑈045000033⑈ 1 8237821004 3⑈ 0989

Name _____
Date _____
Check # _____
Paid To _____
_____
Amount $
_____

Corporation Name _____ **No.** _____

_____ **19** ___

Pay to the Order of _____ **$** _____

_____ **Dollars**

Wealthy Bank Of America

Memo _____ _____

⑈045000033⑈ 1 8237821004 3⑈ 0989

Corporation Name: _____ Account #: _____

Check #	Date	Items	√	Debit	Credit	Balance

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Introduction
Taxonomy Reference: 3. Managerial Processes

Lesson 1 of 1

BACKGROUND:

This series of lessons is developed to provide a 12-week learning unit in prototype development. It begins with a needs assessment in the form of a problem statement. It proceeds through the designing and engineering phases to the time when a presentation is made to management about the feasibility of the prototype becoming a production item.

Students should be entering this course with some understanding of the manufacturing systems. Likely it will be from the middle school program.

Facilities for this course have been in existence for years. They have served traditional programs well. They will adapt to this course readily.

Traditional facilities are set up basically for material processing. They might be metals or non-metals (wood, plastic, etc.). The instructor can teach specific lesson information about tools, materials, and processes as before. Some new lessons will need to be adapted.

Traditional teachers can continue to do what they do well. They asked to change the emphasis of every lesson to problem-solving and decision-making not making things. This might be a revitalizing experience for those individuals who feel the discouragement of professional "burn-out".

There are many references for these lessons. They are identified in the Industrial Technology Systems Handbook. A few are listed for special lessons.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Identify the major tools, materials, and processes in the laboratory.
b. Recite general rules for conduct in the laboratory.
c. Describe the importance of research and development (R&D) in manufacturing.

INTRODUCTION:

Every tool, machine, materials, and process underwent R&D at some time. Give examples of designing and redesigning, model changing, etc.

DEMONSTRATION/LECTURE:

1. Explain behavioral expectations in the laboratory.
2. Survey the laboratory layout as an R&D facility describing each piece of equipment.
3. Assure students that they will be operating the laboratory.

ACTIVITY:

1. Time permitting, have students fold and fly a paper airplane.

EQUIPMENT AND SUPPLIES:

8 1/2 x 11 notebook paper

ASSIGNMENT:

1. List problems associated with poor airplane flight.

TEACHER NOTES:

1. Develop a list of materials available to the students.
2. Develop a list of all the processes adaptable to each machine and power tool in the laboratory. These will be needed in the Facilities and Processes lesson.

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: How Not To Rediscover the Wheel

Taxonomy Reference: 3.3.2 Designing the Product
3.3.2.1 Researching

Lesson 1 of 1

BACKGROUND:

Many resources are available for research and development activities.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Locate research and development reference materials.

INTRODUCTION:

All too often experimenters feel they have to be original in their activities and do something no one has done before. This is foolish. Technology progresses on the basis on what has been done before.

DEMONSTRATION/LECTURE:

1. Describe the index systems provided in libraries for topic searches.
2. Explain the process for performing a patent search for a product.
3. Discuss the procedure for seeking a patent.

ACTIVITY:

1. Have students use such resources as Applied Science and Technology Index, Thomas Register for manufactured goods, Electronics Master Patent Index, Popular Mechanics, Popular Science, catalogs, etc.

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

1. Search for the patent related to some familiar tool or appliance. Note how many times it has been updated or revised.

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development
Taxonomy Reference: 3.3.2 Designing the Product
3.3.2.1 Researching

Lesson 1 of 1

BACKGROUND:

All products on the market today perform some function. They reached there first through R&D. If they do not remain effective, efficient and economical, production ceases.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Explain effectiveness, efficiency and economy related to various products.
b. Describe product analysis procedures.

INTRODUCTION:

We all buy and use industrial goods. Some we like. Some we do not like.

Discuss some time-tested products and some that have left the market.

DEMONSTRATION/LECTURE:

1. Explain effectiveness, efficiency and economy related to products.
2. Discuss how this relates to designing (appearance) and engineering (function).

ACTIVITY:

1. Sketch the instrument panel of an automobile. Make other sketches relocating specific components for effectiveness and efficiency. Also consider auxiliary gauges.

EQUIPMENT AND SUPPLIES:

Pencil and paper

ASSIGNMENT:

1. Think about something at home or work that could be made more effective or efficient: storage; work station arrangements; etc.

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Design Cycle
Taxonomy Reference: 3. Managerial Processes
3.3 Managed Systems Activities
3.3.2 Designing the Product

Lesson 1 of 1

BACKGROUND:

Designing and engineering involve the same cycle steps. Emphasize the need to include every step or an inferior product could result. Consider especially the recall process for different products. Writing true problem statements can be a chore. Using existing product names can be delimiting. For example, talk about "supporting", "containing", and "storing", not aquarium stands, tools boxes, or book cases.

Inventors and others in R&D keep records. Students should maintain a folder of all sketches, notes, handouts, etc., accumulated during the course.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Prepare a problem statement.
b. Describe the steps in the Design Cycle.

INTRODUCTION:

Share ideas that students have prepared.

DEMONSTRATION/LECTURE:

1. Explain the steps in the Design Cycle.
   a. Identify the problem.
   b. Gather information and create preliminary sketches.
   c. Refine sketches.
   d. Analyze sketches.
   e. Make a decision.
   f. Implement the decision.
2. Show how to write a problem statement.

ACTIVITY:

1. Write a problem statement related to meeting a need or want for an industrial product that they wish to produce.
2. Prepare a folder for all notes, sketches, etc. Have students put their names on them.

EQUIPMENT AND SUPPLIES:

Pencil and paper
Manila folders

ASSIGNMENT:

1. Now that the problem has been identified, think about the appearance of the intended product. What should it look like? In what surroundings will it be used? Begin making some sketches.

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Being Accountable
Taxonomy Reference: 3.1.2 Organizing
3.1.3 Actuating (Directing)

Lesson 1 of 1

BACKGROUND:

All people employed in industry are held accountable for productivity. They will perform some task related to the Industrial Technology Systems (ITS) Handbook conceptual framework.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Prepare an Accountability Sheet for recording all their activities during the course.

INTRODUCTION:

Some people work for R&D Organizations; Battelle Memorial Institute is an example. They perform services under contacts with other corporations.

Some companies have their own R&D Departments. Employees there are always trying to make their products more marketable to their customers.

DEMONSTRATION/LECTURE:

1. Define productivity.
2. Accountability is the system for recording people's actions.
3. Activities are the basis upon which people are paid for working.
4. Inventors date and sign all memos, notes, sketches, etc., that they create.
5. People lose their jobs when productivity lessens.
6. Create a conceptual framework for activities.

Management Practices		Production Practices	
Planning	(MP)	Separating	(PS)
Organizing	(MO)	Forming	(PF)
Controlling	(MC)	Combining	(PC)
Directing	(MD)		

7. Layout the format for a student Accountability Sheet such as:

Name _____
Class _____

ACCOUNTABILITY SHEET FOR R&D ACTIVITIES

DATE	ACTIVITY	TIME	CONCEPT
9/1	Brainstorming ideas (Make daily entries)	30 min.	MP

ACTIVITY:

1. Assist students in preparing an Accountability form. Remind them that activities are to be reported each day.
2. Date and sign all papers in the folder.

EQUIPMENT AND SUPPLIES:

Manila envelopes or folders for metebool size paper

ASSIGNMENT:

1. Report activities daily on the Accountability form.

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Facilities and Processes
Taxonomy Reference: 2. Transformation Processes
2.2 Secondary Processing
2.3.2 Forming
2.3.3 Separating

Lesson 1 of 2

BACKGROUND:

This may be a one or two day lesson depending on the available equipment. Have the lists of production processes and available materials described in Lesson 1. Divide them according to metals and non-metals. Metals might be hot and cold rolled steel, aluminum, copper, etc. Non-metals could be species of lumber, types of manufactured paneling, acrylic plastic sheets, injection molding pellets, etc.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Name the stationary and portable machines and tools in the lab.
b. Identify the materials they have to work with in the lab.

INTRODUCTION:

Review the management and production practices concepts from yesterday. Relate them to facilities today.

DEMONSTRATION/LECTURE:

1. Materials can be processed in three major conceptual areas: separating, forming, and combining.

SEPARATING	FORMING	COMBINING
Shearing (no scrap)	Casting	Mixing
Material removal (accumulates waste chips)	Molding	Coating
	Compressing	Bonding
	Stretching	Cohesive
Fracturing (cutting glass)	Conditioning	Adhesive
	Hardening	Mechanical
Thermal (laser, cutting torch, etc.)	Tempering	Fastening
	Normalizing	
Chemical (EDM)		

DEMONSTRATION/LECTURE: (Continued)

2. Describe all equipment in the lab based on the operations each piece performs according to the Accountability sheet developed yesterday.

ACTIVITY:

1. Students can begin developing a list of materials for their prototype.
2. The next two days are for sketching.

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

1. Continue sketches of prototype.

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Facilities and Processes
Taxonomy Reference: 2. Transformation Processes
2.2 Secondary Processing
2.3.2 Forming
2.3.3 Separating

Lesson 2 of 2

BACKGROUND:

This is an extension of yesterday's lesson.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Name the stationary and portable machines and tools in the lab.

INTRODUCTION:

Review main topics from yesterday's lesson.

DEMONSTRATION/LECTURE:

ACTIVITY:

1. Continue demonstrations and discussions.

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

1. Continue prototype sketching.

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Prototype Sketching
Taxonomy Reference: 3. Managerial Processes
3.3 Managed Systems Activities
3.3.2 Designing the Product

Lesson 1 of 2

BACKGROUND:

Most people think in three dimensions. They can visualize pictorial drawings most easily. Have students create isometric sketches freehand on plain or graph paper. Well made sketches serve R & D purposes as well as mechanically made or computer assisted drawings.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Create rough sketches of possible prototypes for development.

INTRODUCTION:

Sketching is a quick way to record ideas. The more of them you prepare, the more promising your final decision will be for success.

DEMONSTRATION/LECTURE:

1. Freehand sketching is an art. Learn to do it well.
2. Describe the process of creating:
    1. rough sketches
    2. thumbnail sketches
    3. refined sketches
3. Two types of pictorial sketches we will use are isometric and perspective. Isometric is easier and most useful because all lines are parallel. Sketch both types on the board or acetate on a projector stage.
4. Illustrate the proper method for sketching straight and curved lines.
5. Show how dimensions are to be added to refined sketches.

ACTIVITY:

1. Have students review their problem statement.
2. Have students begin making rough sketches.

EQUIPMENT AND SUPPLIES:

Pencils and plain paper or
30 degree isometric graph paper for sketches

ASSIGNMENT:

TEACHER NOTES:

1. Remind students to maintain their Accountability Sheet.

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Prototype Sketching
Taxonomy Reference: 3. Managerial Processes
3.3 Managed Systems Activities
3.3.2 Designing the Product

Lesson 2 of 2

BACKGROUND:

Thumbnail and refined sketches follow the rough sketching.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Create a refined sketch with dimensions.

INTRODUCTION:

Sketches and drawings should allow someone on the other side of the earth to produce a matching prototype. This means dimensions are included also.

DEMONSTRATION/LECTURE:

1. Explain dimensioning.

ACTIVITY:

1. Students are to produce refined sketches.

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Human Factors
Taxonomy Reference: 3.3.2 Designing the Product

Lesson 1 of 1

BACKGROUND:

The ability of people to reach, stretch, lean, and bend has an affect on many product sizes. Convenience or ease-of-use is another factor. Having tools, materials, and supplies where they can be gotten to easily is often important.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Relate human factors to standard measurements as well as variable measurements.

INTRODUCTION:

The measurement of distances often is controlled by standard measures. Distance also relates to the sizes of people: infants, youth, adults, and the handicapped.

DEMONSTRATION/LECTURE:

1. Discuss areas in the home or school where measurements affect human comfort and convenience.
2. Explain standard measures. (Relate to architectural as well as clothing standards.)
3. Talk about individual differences among people of different ages and sizes.

ACTIVITY:

1. Have students analyze the school for barriers to wheelchairs, people on crutches, student sizes, etc.
2. Discuss processing procedures as you review and approve plans.

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Engineering Cycle
Taxonomy Reference: 3.3.2 Designing the Product

Lesson 1 of 1

BACKGROUND:

Designing and engineering are essential to prototype development. The steps in the Engineering Cycle are the same as the Design Cycle. However, the problem-solving and decision-making activities differ.

Shop drawings are produced during the Engineering Cycle. In addition to the refined sketches and dimensions, a Bill of Material and a Plan of Procedure are created.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Proceed with the preparation of a set of shop drawings for a prototype.
b. Name all components of the prototype
c. Prepare a Bill of Material
d. Establish a Plan of Procedure.

INTRODUCTION:

You have been using the six steps in the Design Cycle: review them. We use the same steps to create an Engineering Cycle. (Have a transparency of a typical product that students can produce.)

DEMONSTRATION/LECTURE:

1. The steps in the Engineering Cycle are:
   a. Identify the problem.
   b. Gather information and create preliminary sketches.
   c. Refine sketches.
   d. Analyze sketches.
   e. Make a decision.
   f. Implement the decision.
2. Discuss part names for the prototype. Create a Bill of Material from them. Be sure to include dimensions.
3. Establish a Plan of Procedure from which to work. This could be described as a PERT Chart.

ACTIVITY:

1. Students will prepare the Bill of Material and the Plan of Procedure

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Models and Mock-Ups
Taxonomy Reference: 3.3.2 Designing the Product

Lesson 1 of 2

BACKGROUND:

Problems often can be solved after researching human factors and other matters. This should be done as quickly and economically as possible. Paper, clay, or cardboard may provide an economical medium for experimentation.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Describe how models and mock-ups communicate ideas economically.
b. Create soft and hard models and mock-ups.

INTRODUCTION:

Models are a visible method of showing how a device or product will look and/or how it should function. Each student should have a refined sketch, with dimensions, of the prototype to be manufactured.

DEMONSTRATION/LECTURE:

1. Models communicate ideas effectively, efficiently, and at low cost.
2. There are several types of three-dimensional models or mock-ups. They may be full size or at a scale. They are:
   a. Soft Model - one prepared for appearance only. It may be made of paper, cardboard, or similar materials. It can be colored or painted to add life-like characteristics.
   b. Hard Model - one prepared as a working model. It may be made of scrap materials, even cardboard. Any moving parts must be operational: hinges, etc.

ACTIVITY:

1. Create a three-dimensional model or mock-up of the prototype to be produced.
2. Discuss processing procedures as you review and approve plans.

EQUIPMENT AND SUPPLIES:

Appropriate inexpensive materials.

ASSIGNMENT:

TEACHER NOTES:

1. Remind students to maintain their Accountability Sheets.

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Models and Mock-Ups
Taxonomy Reference: 3.3.2 Designing the Product

Lesson 2 of 2

BACKGROUND:

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Create soft and hard models or mock-ups.

INTRODUCTION:

DEMONSTRATION/LECTURE:

ACTIVITY:

1. Discuss processing procedures as you review and approve plans.

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Available Industrial Standard Stock

Taxonomy Reference: 3.3.2 Designing
3.3.3 Preparing to Produce the Product

Lesson 1 of 1

BACKGROUND:

The materials may vary. They might include:

* Metals such as:
    1. hot rolled steel
    2. cold rolled steel
    3. tool steel
    4. plated steel
    5. aluminum
    6. copper

*Non-metals like:
    1. lumber
    2. appearance paneling
    3. performance panels (particleboard, hardboard, etc.)
    4. plastics (thermoplastic and thermoset)
    5. fiberglass resin and hardener, rovings, and/or mats
    6. leather
    7. others - (especially if community related)

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Name the available production materials in the lab.

INTRODUCTION:

Learning about production with any material involves the same conceptual processes. Specific machines and tools may change. Keep in mind that a table saw is equally effective for separating wood or plastic, just the tooling (blade) changes. An engine lathe is not restricted to removing metal materials. It is also effective with plastic, wood, rubber, etc. The tooling (cutting angle) changes. The same cutter angles occur with drilling.

DEMONSTRATION/LECTURE:

1. List inventory items on the board or projector acetate. Describe each to the class.

ACTIVITY:

1. Finish up the three-dimensional models or demonstrate the various processing operations with machines and tools.
2. Create tooling lists for machines and identify the separating concept that occurs at the point-of-operation.
3. Discuss processing procedures as you review and approve plans.

EQUIPMENT AND SUPPLIES:

Varies according to inventory.

ASSIGNMENT:

1. Make material decisions about prototypes.

TEACHER NOTES:

1. Create a display of available materials.

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Alternative Adhesive Materials

Taxonomy Reference: 2.3.5 Assembling
2.3.5.1 Bonding

Lesson 1 of 1

BACKGROUND:

Bonding materials often is misunderstood. Many people have the false notion that all cohesive and adhesive materials will bond anything. If that were true, only one product would be on the market.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Name the cohesive and adhesive bonding materials available in the lab.

INTRODUCTION:

There is no universal bonding material. Cohesive materials melt the parent materials back together. Examples are thermal bonding when welding metals or chemical bonding when combining plastics with solvent. Adhesive materials make use of a dissimilar material. Examples are:

1. Solder or brazing rod for metal.
2. Hide glue, polyvinyl resin, resorcinol, casein, contact cement epoxy resin are for wood.
3. Mastic for wood and vinyl.
4. Paste for paper.
5. Rubber cement for leather.
6. Cements for plastic.

DEMONSTRATION/LECTURE:

1. List inventory items on the board or projector acetate. Describe each to the class.
2. Explain:
   a. shelf life - the time a container of adhesive can be stored without losing its effectiveness.
   b. pot life - length of time the material can be mixed before it starts to set.
   c. tack time - length of time adhesive will remain workable from when it is spread until it begins to set.

DEMONSTRATION/LECTURE: (Continued)

d. set time - the time it takes for solvents to evaporate from adhesives after they have been applied to wood or other materials.
e. curing time - the time needed for chemical bonding to take place between the adhesive and the marent material.
f. drying time - the time required for setting and curing.
g. clamp time - some materials specify the length of time pressure should be used to position components bonded with adhesives.

ACTIVITY:

1. Demonstrate machines, tools, and/or bonding procedures.
2. Discuss processing procedures as you review and approve plans.

EQUIPMENT AND SUPPLIES:

Varies according to inventory.

ASSIGNMENT:

1. Make material decisions about prototypes.

TEACHER NOTES:

1. Create a display board of available bonding agents with time elements shown.

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Alternative Mechanical Fasteners

Taxonomy Reference: 2.3.5 Assembling
2.3.5.2 Mechanical Fastening

Lesson 1 of 1

BACKGROUND:

Mechanical fasteners are almost too numerous to mention. Screws, nails, hinges, pulls, and staples are among the alternatives.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Name the mechanical fasteners available for bonding.

INTRODUCTION:

Hardware and discount stores inventory many fasteners. Discuss some examples.

DEMONSTRATION/LECTURE:

1. List inventory items on the board or projector acetate. Describe each to the class.
2. Finish any equipment not demonstrated.

ACTIVITY:

1. Check refined sketches against available material lists.
2. Discuss processing procedures as you review and approve plans.

EQUIPMENT AND SUPPLIES:

Varies according to inventory.

ASSIGNMENT:

1. Make material decisions about prototypes.

TEACHER NOTES:

1. Create a display board of available bonding agents with time elements shown.

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Laboratory Benefits and Risks

Taxonomy Reference: 3.3.4.3 Establishing Safety Programs

Lesson 1 of 1

BACKGROUND:

Safety education is an important phase of technology education. Show students the benefits of all the separating, forming, and combining equipment. Explain the risks associated with the operations equipment as well as the other potential causes for accidents and injuries. These include falling, inhaling, pinching, etc.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Identify the point-of-operation for all equipment.
b. Discuss risks in the lab.

INTRODUCTION:

No laboratory is safe. It cannot be made free of possible accidents and injuries. Safety is everyone's business.

DEMONSTRATION/LECTURE:

1. Review various machines' points-of-operations.
2. Explain unsafe acts.
3. Describe hazardous conditions.
4. Announce the knowledge and performance tests on machine operations.

ACTIVITY:

1. Have students list hazardous conditions within the lab and other parts of the school building.
2. Discuss processing procedures as you review and approve plans.

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Producing a Prototype
Taxonomy Reference: 3.3.2 Designing the Product
3.3.3 Preparing to Produce the Product

Lesson 1 of up to 35

BACKGROUND:

Students are producing individual prototypes. There are about 35 days allowed for this project. There will be other partial day production time while other lectures and demonstrations are underway.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Remain productive while completing the operations leading to the completion of the prototype
b. Learn to be flexible in scheduling work in case of delays.

INTRODUCTION:

People in industry who work at prototype development usually are skilled in many tasks. They work independently most of the time. Accountability is difficult to monitor. Too often a planned process or procedure is not acceptable. Then the whole process might have to be scrapped.

Keep in mind that all the products you purchase went through this process. A small percentage of the purchase price is set aside to cover the R & D costs. You will be explaining the cost and feasibility of yours at the end of the course.

DEMONSTRATION/LECTURE:

1. Discuss alternative procedures in case others are waiting to operate certain critical machines.
2. Discuss special problems confronting students as they occur.

ACTIVITY:

1. Begin prototype production.
2. Finish reviewing and approving plans.

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

TEACHER NOTES:

1. Remind students to maintain their Accountability Sheets daily.

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Developing Jigs and Fixtures

Taxonomy Reference: 3.3.3 Preparing to Produce the Product

Lesson 1 of 1

BACKGROUND:

The development of jigs and fixtures can be a challenge even to the instructor. A jig is a device for securing components and guiding tools during processing. A dowel jig is an example. A fixture secures components. An example is a bench vise.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Explain the difference between jigs and fixtures.
b. Describe the need for jigs and fixtures.
c. Create jigs and fixtures as needed.

INTRODUCTION:

Jigs and fixtures are adaptable for many separating, forming, and combining operations. Some examples are: dowel jigs; dovetail jigs; aids for clamping or bending wood; V-blocks for drilling; turntables for spraying; etc.

DEMONSTRATION/LECTURE:

1. Jigs and fixtures are aids to production.
2. Design and build them for easy set-up and disassembly.
3. Be aware of problems such as chip accumulation. Chips can collect and make workpiece alignment difficult. Get them away from the point-of-operation and any guides. One suggestion is to use dowels instead of straightedge guides.
4. Devise a system to allow repeated set-ups later. For example, drill a hole in the drilling jig where the workpiece is to be drilled. The next time the jig is needed, install the drill in the chuck; lower it into the hole; and clamp the jig in place.
5. Demonstrate a sample jig or fixture prepared previously.

ACTIVITY:

1. Develop as necessary for prototypes.

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Abrasives
Taxonomy Reference: 2.3.6.2 Preparing the Material to be Finished

Lesson 1 of 1

BACKGROUND:

Abrasive tooling refers to the traditional practice of sanding.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Identify natural and synthetic abrasives.
b. List the various abrasive applications in the lab.

INTRODUCTION:

Abrasives are multiple point-of-operation tools. Each grain performs the same function.

The abrasive must be harder than the material it is removing.

DEMONSTRATION/LECTURE:

1. Abrasives are purchased and used in many forms:
   a. Sheets
   b. Belts
   c. Disks
   d. Sleeves or drums
   e. Wheels
   f. Stones
   g. Cakes
   h. Loose
2. Abrasives may be natural or synthetic. Examples are:

Natural	Synthetic
Flint	Aluminum oxide
Garnet	Silicon carbide
Emery	Industrial diamond
Iron oxide (Crocus cloth)	Steel (steel wool)
Pumice	

3. Abrasives are graded from 12 to 600 grit. Exceptions are: pumice, a graded volcanic lava powder F to FFFF; crocus cloth (no grade); and steel wool (triangular strands of steel fibers) #3 to #4/0.

DEMONSTRATION/LECTURE: (Continued)

4. Grit grading is done by screening and flotation. Grits 12-180 are sifted through screens. Above that they are separated by flotation in water. Finer particles rise to the top of the water. Coarser, heavier grits rise less and are floated out of the container through pipes at different levels.
5. Some abrasives for wood are coated with an anti-clog silicone-like lubricant.
6. Follow these steps when using abrasives.
   a. Remove tooth marks with a file.
   b. Remove file marks with 80 or 100 abrasive.
   c. Remove these abrasive marks with finer grit abrasives until the surface quality is reached.
   d. On wood, work in the direction of the grain.
   e. On metal and plastic, proceed through each step in fineness at 90" to the previous grit action. This way, you know when you have removed all the file and coarser grit abrasive marks. You become more efficient at knowing when to use buffing compounds.
   f. Most abrasives are used dry. A silicone coating may be applied during abrasive manufacturing as an anti-clog material.
   g. Some abrasives can be used dry or wet. Water or oil helps float away abraded particles which could clog dry abrasives and mar a surface. Use water when applying finished on wood for between-coat rubbing. Use oil on metal surfaces that might rust. Use water with plastics.

ACTIVITY:

1. Identify all the abrasive tools in the lab.
2. While working on prototypes, use abrasive as little as possible.

EQUIPMENT AND SUPPLIES:

Available abrasives as need arises.

ASSIGNMENT:

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Coatings
Taxonomy Reference: 2.3.6 Finishing

Lesson 1 of 3

BACKGROUND:

A trip to the local paint store reveals the array of available coating materials. It is likely that only a sampling is available in the lab. You may wish to have several days for this lesson. This will allow for setting and curing time so you can demonstrate between-coat smoothing practices after the coatings have dried.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Identify coating materials according to types and solvents.
b. Apply penetrating and built-up coating materials by various methods.

INTRODUCTION:

Coating materials protect surfaces. They either build up on or penetrate them. Some penetrate wood (stains, oils, etc.). Others build up on wood or metal (paint, varnish, shellac, lacquer, etc.). They may be applied by brushing, dipping, rolling, spraying, and wiping.

DEMONSTRATION/LECTURE:

1. Penetrating finishing materials:
   a. Stains - oil, spirit, water
   b. Rubbing oils - tung, lemon
   c. Linseed oil - raw, boiled
2. Built-up finishing materials:
   a. Shellac - white, orange
   b. Varnish - natural, urethane
   c. Lacquer - clear, opaque
   d. Paint - oil, latex, alkyd, acrylic
   e. Enamel - oil, latex, alkyd, acrylic
3. Contents of the can:
   a. Pigment - rock-like, insoluble, opaque coloring agent used in paint, stain, enamel, lacquer or

DEMONSTRATION/LECTURE: (Continued)

a. Extenders - rock-like, insoluble, clear agent used in varnishes.
b. Dye - liquid coloring agent that soaks into the wood surface.
c. Vehicle - material that allows the pigments and dyes to be spread evenly. It contains: solvent that evaporates and resin that cures and holds pigments and dyes in place on the surface. Finishing materials, other than shellac and lacquer, contain dryers. These allow dry latex base surfaces to be washed with water and painted or varnished surfaces to be cleaned with paint thinner. Alcohol, the solvent for shellac, will remove dry shellac. Lacquer thinner will soften and remove dry lacquer.
d. The percentage of these materials varies in the can. Fewer pigments are in gloss finishes than semi-gloss, satin, or flat. Likewise, there is more vehicle in gloss and less in flat or satin finishes. A can of flat finish is heavier than a can of gloss finish.

4. Tools for coating practices:
   a. Select the proper brush. Split end bristles allow for a light touch action when smoothing the wet finish. Air bubbles can be broken and removed easily. Natural bristle brushes are appropriate for finishing materials other than those with a latex base. (The bristles will absorb the water and become limp.)
   b. Rollers have various length of nap. Short nap sleeves work well on smooth surfaces. Use long nap sleeves on concrete blocks and other rough surfaces.
   c. Spray equipment is of three types: suction, pressure, and airless. Mixing and adjusting can be difficult on the first two guns.
   d. Wiping cloths should be lint-free. It is recommended that the person using this process wear plastic gloves.
5. Finishing procedure:
   a. Have surface smooth:
      1. On metals, it should be free of scratches.
      2. On wood, it should be smooth and free of dried adhesive and scratches.
   b. Raise the grain. Do to find any dried, clear glue. Dampen the raw wood surface. It should change color slightly. Where it does not do so, dry adhesive is present. On softwoods and open-grain hardwoods, it will roughen the surface slightly. Use abrasives to resmooth the surface.
   c. Apply filler on open grain hardwood before coating if a flat surface is desired.
   d. Metals and close grain softwood or hardwood are ready for coating when the surface has been smoothed adequately.
   e. Seal surfaces before staining to achieve more even penetration of the dyes.
   f. Seal surfaces after staining to prevent bleeding. Apply a different solvent base sealer from that of the coating material. For example, apply shellac over oil base stain before varnishing.

ACTIVITY:

1. Apply this information as necessary.

EQUIPMENT AND SUPPLIES:

Assortment of finishing materials.

ASSIGNMENT:

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Coatings
Taxonomy Reference: 2.3.6 Finishing

Lesson 2 of 3

BACKGROUND:

A trip to the local paint store reveals the array of available coating materials. It is likely that only a sampling is available in the lab. You may wish to have several days for this lesson. This will allow for setting and curing time so you can demonstrate between-coat smoothing practices after the coatings have dried.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Identify coating materials according to types and solvents.
b. Apply penetrating and built-up coating materials by various methods.

INTRODUCTION:

Coating materials protect surfaces. They either build up on or penetrate them. Some penetrate wood (stains, oils, etc.). Others build up on wood or metal (paint, varnish, shellac, lacquer, etc.). They may be applied by brushing, dipping, rolling, spraying, and wiping.

DEMONSTRATION/LECTURE:

1. Penetrating finishing materials:
   a. Stains - oil, spirit, water
   b. Rubbing oils - tung, lemon
   c. Linseed oil - raw, boiled
2. Built-up finishing materials:
   a. Shellac - white, orange
   b. Varnish - natural, urethane
   c. Lacquer - clear, opaque
   d. Paint - oil, latex, alkyd, acrylic
   e. Enamel - oil, latex, alkyd, acrylic
3. Contents of the can:
   a. Pigment - rock-like, insoluble, opaque coloring agent used in paint, stain, enamel, lacquer or

DEMONSTRATION/LECTURE: (Continued)

a. Extenders - rock-like, insoluble, clear agent used in varnishes.
b. Dye - liquid coloring agent that soaks into the wood surface.
c. Vehicle - material that allows the pigments and dyes to be spread evenly. It contains: solvent that evaporates and resin that cures and holds pigments and dyes in place on the surface. Finishing materials, other than shellac and lacquer, contain dryers. These allow dry latex base surfaces to be washed with water and painted or varnished surfaces to be cleaned with paint thinner. Alcohol, the solvent for shellac, will remove dry shellac. Lacquer thinner will soften and remove dry lacquer.
d. The percentage of these materials varies in the can. Fewer pigments are in gloss finishes than semi-gloss, satin, or flat. Likewise, there is more vehicle in gloss and less in flat or satin finishes. A can of flat finish is heavier than a can of gloss finish.

4. Tools for coating practices:
   a. Select the proper brush. Split end bristles allow for a light touch action when smoothing the wet finish. Air bubbles can be broken and removed easily. Natural bristle brushes are appropriate for finishing materials other than those with a latex base. (The bristles will absorb the water and become limp.)
   b. Rollers have various length of nap. Short nap sleeves work well on smooth surfaces. Use long nap sleeves on concrete blocks and other rough surfaces.
   c. Spray equipment is of three types: suction, pressure, and airless. Mixing and adjusting can be difficult on the first two guns.
   d. Wiping cloths should be lint-free. It is recommended that the person using this process wear plastic gloves.
5. Finishing procedure:
   a. Have surface smooth:
      1. On metals, it should be free of scratches.
      2. On wood, it should be smooth and free of dried adhesive and scratches.
   b. Raise the grain. Do to find any dried, clear glue. Dampen the raw wood surface. It should change color slightly. Where it does not do so, dry adhesive is present. On softwoods and open-grain hardwoods, it will roughen the surface slightly. Use abrasives to resmooth the surface.
   c. Apply filler on open grain hardwood before coating if a flat surface is desired.
   d. Metals and close grain softwood or hardwood are ready for coating when the surface has been smoothed adequately.
   e. Seal surfaces before staining to achieve more even penetration of the dyes.
   f. Seal surfaces after staining to prevent bleeding. Apply a different solvent base sealer from that of the coating material. For example, apply shellac over oil base stain before varnishing.

ACTIVITY:

1. Apply this information as necessary.

EQUIPMENT AND SUPPLIES:

Assortment of finishing materials.

ASSIGNMENT:

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Coatings
Taxonomy Reference: 2.3.6 Finishing

Lesson 3 of 3

BACKGROUND:

A trip to the local paint store reveals the array of available coating materials. It is likely that only a sampling is available in the lab. You may wish to have several days for this lesson. This will allow for setting and curing time so you can demonstrate between-coat smoothing practices after the coatings have dried.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Identify coating materials according to types and solvents.
b. Apply penetrating and built-up coating materials by various methods.

INTRODUCTION:

Coating materials protect surfaces. They either build up on or penetrate them. Some penetrate wood (stains, oils, etc.). Others build up on wood or metal (paint, varnish, shellac, lacquer, etc.). They may be applied by brushing, dipping, rolling, spraying, and wiping.

DEMONSTRATION/LECTURE:

1. Penetrating finishing materials:
   a. Stains - oil, spirit, water
   b. Rubbing oils - tung, lemon
   c. Linseed oil - raw, boiled
2. Built-up finishing materials:
   a. Shellac - white, orange
   b. Varnish - natural, urethane
   c. Lacquer - clear, opaque
   d. Paint - oil, latex, alkyd, acrylic
   e. Enamel - oil, latex, alkyd, acrylic
3. Contents of the can:
   a. Pigment - rock-like, insoluble, opaque coloring agent used in paint, stain, enamel, lacquer or

DEMONSTRATION/LECTURE: (Continued)

a. Extenders - rock-like, insoluble, clear agent used in varnishes.
b. Dye - liquid coloring agent that soaks into the wood surface.
c. Vehicle - material that allows the pigments and dyes to be spread evenly. It contains: solvent that evaporates and resin that cures and holds pigments and dyes in place on the surface. Finishing materials, other than shellac and lacquer, contain dryers. These allow dry latex base surfaces to be washed with water and painted or varnished surfaces to be cleaned with paint thinner. Alcohol, the solvent for shellac, will remove dry shellac. Lacquer thinner will soften and remove dry lacquer.
d. The percentage of these materials varies in the can. Fewer pigments are in gloss finishes than semi-gloss, satin, or flat. Likewise, there is more vehicle in gloss and less in flat or satin finishes. A can of flat finish is heavier than a can of gloss finish.

4. Tools for coating practices:
   a. Select the proper brush. Split end bristles allow for a light touch action when smoothing the wet finish. Air bubbles can be broken and removed easily. Natural bristle brushes are appropriate for finishing materials other than those with a latex base. (The bristles will absorb the water and become limp.)
   b. Rollers have various length of nap. Short nap sleeves work well on smooth surfaces. Use long nap sleeves on concrete blocks and other rough surfaces.
   c. Spray equipment is of three types: suction, pressure, and airless. Mixing and adjusting can be difficult on the first two guns.
   d. Wiping cloths should be lint-free. It is recommended that the person using this process wear plastic gloves.
5. Finishing procedure:
   a. Have surface smooth:
      1. On metals, it should be free of scratches.
      2. On wood, it should be smooth and free of dried adhesive and scratches.
   b. Raise the grain. Do to find any dried, clear glue. Dampen the raw wood surface. It should change color slightly. Where it does not do so, dry adhesive is present. On softwoods and open-grain hardwoods, it will roughen the surface slightly. Use abrasives to resmooth the surface.
   c. Apply filler on open grain hardwood before coating if a flat surface is desired.
   d. Metals and close grain softwood or hardwood are ready for coating when the surface has been smoothed adequately.
   e. Seal surfaces before staining to achieve more even penetration of the dyes.
   f. Seal surfaces after staining to prevent bleeding. Apply a different solvent base sealer from that of the coating material. For example, apply shellac over oil base stain before varnishing.

ACTIVITY:

1. Apply this information as necessary.

EQUIPMENT AND SUPPLIES:

Assortment of finishing materials.

ASSIGNMENT:

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Waste Management
Taxonomy Reference: 4.2 Other Outputs

Lesson 1 of 1

BACKGROUND:

Problems within the environment are creating many hazards. Among them are dust, toxic chemicals, solvent disposal, etc.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Protect themselves from touching, inhaling, or ingesting potentially toxic materials.
b. Understand the need for recycling industrial materials.
c. Understand the problems and inconveniences associated with recycling industrial materials.

INTRODUCTION:

Our "throw away society" creates many problems especially related to health and safety.

DEMONSTRATION/LECTURE:

1. Explain chip and solvent disposal procedures and any other contamination problems in the laboratory: safety cans, solvent disposal containers, etc.

ACTIVITY:

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Cost Analysis
Taxonomy Reference: 3.1.4 Controlling
3.3.7 Controlling the System

Lesson 1 of 1

BACKGROUND:

The Accountability Sheet must be brought up to date.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Establish relative costs associated with producing the prototypes.
b. Prepare a cost analysis for their individual prototypes.

INTRODUCTION:

Industries that can pay their employees and make a profit remain in business. Others go bankrupt.

The cost of all industrial research and development is reflected in what we pay for goods and services.

DEMONSTRATION/LECTURE:

1. Discuss cost factors related to prototype development:
   a. Materials
   b. Labor - management, production, and support personnel.
   c. Overhead
2. Review management and production concepts on the Accountability Sheet.
3. Assign a per-hour rate for management, production, and support personnel.

Management personnel make most decisions and oversee productivity. Assign a figure of $20 per hour for their services. Production personnel create the prototype. Pay them a suggested $10 per hour. Support personnel are secretaries and office workers. Pay them $5 per hour. Students are providing a service function while they are recording productivity time and preparing their reports.

ACTIVITY:

1. Have students list the materials they used. Help them determine the total material cost. Use the Bill of Materials for this activity.
2. Using the Accountability Sheet, have students total the amount of labor time they spent in:
   a. Management concept activities
   b. Production concept activities
   c. Support personnel activities
3. Add materials and labor together for this analysis.

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Prototype Development Presentations

Taxonomy Reference: 3. Managerial Processes

Lesson 1 of 4

BACKGROUND:

Students need an understanding of what it takes to enter, be successful, and remain in business.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Prepare a presentation for the class related to prototype development.

INTRODUCTION:

Help students review their Accountability Sheets to recall problems and solutions. Do the same for the decisions that were made.

DEMONSTRATION/LECTURE:

1. Discuss successes.
2. Discuss failures and how they affected the production cost.
3. Develop a format for short student presentations. Consider:
   a. Problem statement.
   b. Materials required.
   c. Costs in terms of time and material.
   d. Value of the finished product.

ACTIVITY:

1. Help students develop presentations.
2. Establish an order of presentations.

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Prototype Development Presentations

Taxonomy Reference: 3.3.7 Controlling the System

Lesson 2 of 4

BACKGROUND:

Students need an understanding of what it takes to enter, be successful, and remain in business.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Prepare a presentation for the class related to prototype development.

INTRODUCTION:

Help students review their Accountability Sheets to recall problems and solutions. Do the same for the decisions that were made.

DEMONSTRATION/LECTURE:

1. Discuss successes.
2. Discuss failures and how they affected the production cost.
3. Develop a format for short student presentations. Consider:
   a. Problem statement.
   b. Materials required.
   c. Costs in terms of time and material.
   d. Value of the finished product.

ACTIVITY:

1. Help students develop presentations.
2. Establish an order of presentations.

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Prototype Development Presentations

Taxonomy Reference: 3.3.7 Controlling the System

Lesson 3 of 4

BACKGROUND:

Students need an understanding of what it takes to enter, be successful, and remain in business.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Prepare a presentation for the class related to prototype development.

INTRODUCTION:

Help students review their Accountability Sheets to recall problems and solutions. Do the same for the decisions that were made.

DEMONSTRATION/LECTURE:

1. Discuss successes.
2. Discuss failures and how they affected the production cost.
3. Develop a format for short student presentations. Consider:
   a. Problem statement.
   b. Materials required.
   c. Costs in terms of time and material.
   d. Value of the finished product.

ACTIVITY:

1. Help students develop presentations.
2. Establish an order of presentations.

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

TEACHER NOTES:

MODEL INDUSTRIAL TECHNOLOGY SYSTEMS
INSTRUCTIONAL ACTIVITY

Course Title: Manufacturing Technology

Unit Title: Research and Development: Prototype Development Presentations

Taxonomy Reference: 3.3.7 Controlling the System

Lesson 4 of 4

BACKGROUND:

Students need an understanding of what it takes to enter, be successful, and remain in business.

OBJECTIVES:

As a result of this learning experience, students will be able to:

a. Prepare a presentation for the class related to prototype development.

INTRODUCTION:

Help students review their Accountability Sheets to recall problems and solutions. Do the same for the decisions that were made.

DEMONSTRATION/LECTURE:

1. Discuss successes.
2. Discuss failures and how they affected the production cost.
3. Develop a format for short student presentations. Consider:
   a. Problem statement.
   b. Materials required.
   c. Costs in terms of time and material.
   d. Value of the finished product.

ACTIVITY:

1. Help students develop presentations.
2. Establish an order of presentations.

EQUIPMENT AND SUPPLIES:

None

ASSIGNMENT:

TEACHER NOTES:

APPENDIX C

Satellite School Programs

THE MODEL INDUSTRIAL TECHNOLOGY SYSTEMS PROJECT

May 5, 1986

PROJECT DIRECTOR:
Dr. Ernest N. Savage
Bowling Green State University
(419)-372-8873

PROJECT SECRETARY:
Mrs. Marsha S. Bostelman
Bowling Green State University
(419)-372-8873

PROJECT MONITOR
Mr. Joe R. Logsdon
Ohio Department of Education
(614)-466-2211

CENTRAL SITE:
Dr. Paul E. Post,
Site Co-Director
Dr. William D. Umstattd,
Site Co-Director
Ohio State University
-422-7471

COLUMBUS CITY SCHOOLS:
Mr. James L. Cameron,
Supervisor Career Education
(614)-464-9901

NORTHEAST SITE:
Dr. Terry J. Squier,
Site Director
Kent State University
(216)-672-2892

SPRINGFIELD LOCAL:
(Summit County)
Mr. James D. Gray,
Superintendent
(216)-784-0421

NORTHWEST SITE:
Dr. Ronald E. Jones,
Site Director
Bowling Green State University
(419)-372-7567

SPRINGFIELD LOCAL
(Lucas County)
Dr. George E. Tombough,
Superintendent
-2400

Mr. Gary Finke
Oak Harbor High School
11661 W SR 163
Oak Harbor, OH 43449

Dear Gary:

We have received the signed copy of the Agreement to Participate in the Model Industrial Technology Systems Project. Congratulations on becoming the charter member of the satellite program.

Enclosed find a Standards for Industrial Arts Program Evaluation form. Please complete the evaluation as soon as possible and return it to the project office for analysis. You will receive a copy of the analysis in a few weeks. Your program will be re-evaluated in two years using the same instrument to determine program status at that time and to compare that status with the present evaluation.

In the near future, you will be receiving the following materials from the project:

9 each Elementary Technology Education Units K-2 (Enclosed).

4 each 6-week units for Industrial Technology at the high school level.

An integrated course for Middle School/Junior High Industrial Technology.

We are anxious to receive copies of your Robotics and Computer Integrated Manufacturing curriculum material. If we can help in any way to facilitate format or typing, please do not hesitate to contact us.

A PROJECT SPONSORED BY THE OHIO DEPARTMENT OF EDUCATION IN COOPERATION WITH THE OHIO INDUSTRIAL ARTS ASSOCIATION

The project office hours are: 8:00 a.m. to 5:00 p.m. on Mondays and Wednesdays and 1:00 p.m. to 4:00 p.m. on Thursdays. From May 12 through August 15 (summer hours), the project office hours will be 7:30 a.m. to 5:00 p.m. on Mondays and Wednesdays only. The telephone number is 419-372-8873. Our mailing address is:

Bowling Green State University
College of Technology
Dr. Ernest N. Savage
Model Industrial Technolgy Systems Project
Bowling Green, OH 43403

Keep up the good work! Welcome to the team.

Sincerely,

Dr. Ernest N. Savage
Project Director

ENS:msb/L23
Enclosures

cc: T. Harbal
M. Hoover
J. Logsdon

THE MODEL INDUSTRIAL TECHNOLOGY SYSTEMS PROJECT

April 15, 1987

PROJECT DIRECTOR:
Dr. Ernest N. Savage
Bowling Green State University
(419)-372-8872

PROJECT SECRETARY:
Mrs. Marsha S. Bostelman
Bowling Green State University
(419)-372-8873

PROJECT MONITOR
Mr. Joe R. Logsdon
Ohio Department of Education
(614)-466-2211

CENTRAL SITE:
Dr. Paul E. Post,
Site Co-Director
Dr. William D. Umstatd,
Site Co-Director
The Ohio State University
(614)-422-7471

COLUMBUS CITY SCHOOLS:
Mr. James L. Cameron,
Supervisor Career Education
(614)-464-9901

NORTHEAST SITE:
Dr. Terry J. Squier,
Site Director
Kent State University
(216)-672-2892

SPRINGFIELD LOCAL:
(Summit County)
Mr. James D. Gray,
Superintendent
(216)-784-0421

NORTHWEST SITE:
Dr. Ronald E. Jones,
Site Director
Bowling Green State University
(419)-372-7567

SPRINGFIELD LOCAL
(Lucas County)
Mr. George E. Tomlinson,
Superintendent
(419)-866-2400

Mr. Robert Vorac
Dublin Middle School
144 W. Bridge St.
Dublin, OH 43017

Dear Bob:

On behalf of the Model Industrial Technology Systems Project, I would like to welcome you as a member of the Satellite School Program. On Wednesday, March 18, 1987, Mr. Joe Logsdon from the Ohio Department of Education and I visited your program and were extremely pleased by the Technology Education Program that we viewed. I would like to review for you the program as it was presented to us in order that we may clarify any discontinuity. The sixth grade program consists of three sections of approximately 26-30 students. Those students meet for 43 minutes per day for a seven-week long block. In this course, the primary focus is the World of Construction in which students design and construct a model "dream house". In the process of constructing the dream house, students are exposed to measurement and calculations regarding the cost per square foot which reinforces their mathematic skills; design which reinforces their communication skills; and economics through a study of buying power. In fact, I believe that for the three classes approximately $2.5 million of simulated loans were given out to the students. I believe that your next step of this course is to identify the city and regional planning requirements in construction.

In the seventh grade, you have three sections of approximately 25-30 students who are in class for 43-minute periods over a seven-week long block. In this course, students receive an overview of Communication Technology through the development of three-view drawings and CAD Draw; Production Technology through the custom production of a lamp (included in this production activity is an overview of electricity including safety and fusing). The Manufacturing Technology sequence is process oriented giving students experience with flow charting, fixture building, mass production, logo design, computer, and automation via the use of X-Y tables. The Energy and Power aspect of the course is included in both the Manufacturing sequence through the automation component as well as in the Custom Production area.

We believe that your program represents what we hope middle school technology education will become in Ohio; a quality process-oriented technology literacy directed program. In our interview with Mr. King, the building principal, we found that he is very aware of your performance and has high praise for your ability not only as a technology educator, but also as a teacher who is working to instill proper work values and attitudes to his students. You are to be commended on that front as well.

In the near future, you will be receiving curriculum material from the project office. Included in that material will be the 16 units developed for elementary school technology education; new course material developed for the middle school (hopefully you can incorporate some of this into your program); and four six-week units for high school industrial technology focusing on the four technology systems of Communication, Construction, Energy/Power, and Manufacturing. I will also be sending you our format for course development. I would appreciate it if you could rough out your courses along those format lines so that we may be able to include your course material in any further dissemination of our Model Schools Instructional Materials. Cutting and pasting is all that will be needed from you in order for Marsha, the project secretary, to put that material on the word processor. She will then get it back to you for final review.

Once again, congratulations on your selection as a Satellite Program and continued development as a model program for any middle school technology education program. I believe that the future of our profession rests in the hands of classroom teachers like yourself who are willing to incorporate relevant, contemporary curriculum material into their classroom in order to direct and help our students to become more productive citizens into the 21st century.

Sincerely,

Ernest N. Savage

Dr. Ernest N. Savage
Project Director

ENS:msb/L50

cc: Mr. Paul King
Mr. Joe Logsdon

THE MODEL INDUSTRIAL TECHNOLOGY SYSTEMS PROJECT

April 15, 1987

PROJECT DIRECTOR:
Dr. Ernest N. Savage
Bowling Green State University
(419)-372-8673

PROJECT SECRETARY:
Mrs. Marsha S. Bostelman
Bowling Green State University
(419)-372-8673

PROJECT MONITOR
Mr. Joe R. Logsdon
Ohio Department of Education
(614)-466-2211

CENTRAL SITE:
Dr. Paul E. Post,
Site Co-Director
Dr. William D. Umstattd,
Site Co-Director
The Ohio State University
(614)-422-7471

COLUMBUS CITY SCHOOLS:
Mr. James L. Cameron,
Supervisor Career Education
(614)-464-9901

NORTHEAST SITE:
Dr. Terry J. Squier,
Site Director
Kent State University
(216)-672-2892

SPRINGFIELD LOCAL:
(Summit County)
Mr. James D. Gray,
Superintendent
(216)-784-0421

NORTHWEST SITE:
Dr. Ronald E. Jones,
Site Director
Bowling Green State University
(419)-372-7567

SPRINGFIELD LOCAL
(Lucas County)
Dr. George E. Tombaugh,
Superintendent
(419)-866-2400

Mr. Lon Briggs
Westland High School
146 Galloway Rd.
Galloway, OH 43119

Dear Lon:

On behalf of the Model Industrial Technology Systems Project, I would like to welcome you as a member of the Satellite School Program. On Wednesday, March 18, 1987, Mr. Joe Logsdon from the Ohio Department of Education and I visited your program and were extremely pleased by the Technology Education Program that we viewed. I would like to review for you the program as it was presented to us in order that we may clarify any discontinuity. There are approximately 25-28 students in five classes ranging in time from 48-51 minutes over a 36-week period of time. Students in the class are primarily freshman, and there are seven females in the class. Your budget is approximately $3,000 per year which includes lab fee monies of $10 per student. The Construction Technology Program that I observed is without question the finest Construction Technology Program in the state of Ohio. It is certainly among the top 10 programs in the nation. I believe that this is a reflection on your ability to synthesize information and your willingness to change, which results in the presentation of relevant content to students as they begin to recognize the constructed environment in which they live. Your ability to change is further evidenced by the development of a new course called "Construction Management", which will be a semester-long course that will provide students with an understanding of the management processes relative to Construction Technology.

In the near future, you will be receiving curriculum material from the project office. Included in that material will be the 16 units developed for elementary school technology education; new course material developed for the middle school; and four six-week units for high school industrial technology focusing on the four technology systems of Communication, Construction, Energy/Power, and Manufacturing (hopefully you can incorporate some of this into your program). I will also be sending you our format for course development. I would appreciate it if you

could rough out your courses along those format lines so that we may be able to include your course material in any further dissemination of our Model Schools Instructional Materials. Cutting and pasting is all that will be needed from you in order for Marsha, the project secretary, to put that material on the word processor. She will then get it back to you for final review.

Once again, congratulations on your selection as a Satellite Program and continued development as a model program for any middle school technology education program. I believe that the future of our profession rests in the hands of classroom teachers like yourself who are willing to incorporate relevant, contemporary curriculum material into their classroom in order to direct and help our students to become more productive citizens into the 21st century.

Sincerely,

Ernest N. Savage

Dr. Ernest N. Savage
Project Director

ENS:msb/L50

cc: Mr. Joe Logsdon
Mr. James McCormick

THE MODEL INDUSTRIAL TECHNOLOGY SYSTEMS PROJECT

May 20, 1987

PROJECT DIRECTOR:
Dr. Ernest N. Savage
Bowling Green State University
(419) 372-8073

PROJECT SECRETARY:
Mrs. Martha S. Donaldson
Bowling Green State University
(419) 372-8073

PROJECT MONITOR:
Mr. Paul E. Rose
(614) 466-2761

CENTRAL SITE:
Dr. Paul E. Rose
Site Co-Director
Dr. William D. Brinkman
Site Co-Director
The Ohio State University
(614) 422-7431

COLUMBUS CITY SCHOOLS:
Mr. James L. Logsdon
Director, Career Education

Mr. William Brinkman
Donnell Junior High School
301 Baldwin Ave.
Findlay, OH 45840

Dear Bill:

On behalf of the Model Industrial Technology Systems Project, I would like to welcome you as a member of the Satellite School Program. On Tuesday, April 21, 1987, Mr. Joe Logsdon from the Ohio Department of Education and I visited your program and were extremely pleased by the curriculum that we viewed. I would like to review for you the program as it was presented to us in order that we may clarify any discontinuity. The total school enrollment at Donnell Junior High, which encompasses grades 7, 8, and 9, is approximately 475 students. Next year that number will be reduced to about 438 students. The facility is very well equipped in a traditional mode.

In grade 7, all students take industrial technology for nine weeks for a 42-minute period. That program, called Introduction To Industry, involves five and one-half to six weeks of custom production, which is a lab-oriented experience using tools and materials and wood and metal as a medium; and a three to three and one-half weeks Manufacturing activity where the students deal with issues of Cost Analysis, Manufacturing Processes, and Marketing. In grade 8, students can elect to select either industrial technology or home economics. In this program, you presently have approximately 60 boys and 10 girls. This 18-week course deals with Materials Processing; woods, metals, and plastics for 12 weeks and Communication; photography, drafting, and screen processing for 6 weeks. The ninth grade program entitled Materials Technology is a one-year course. You presently have 37 boys and 3 girls enrolled in that program. The first 16 weeks deal with metals specifically a sheet metal fabrication project, a machine tool project, a foundry project, and a copper tooling and finishing project. Sixteen weeks are then spent in wood focusing on the building of a large craftsmanship-oriented project such as a regulator clock or wall shelf. The final three to four weeks of this course are spent in plastics dealing with machining and thermoforming as well as injection molding and plastisol dipping. This course is by far the most traditional of the three courses, and some curriculum work reflective of the four technology systems could be used here.

A PROJECT SPONSORED BY THE OHIO DEPARTMENT OF EDUCATION IN
COOPERATION WITH THE OHIO INDUSTRIAL TECHNOLOGY EDUCATION ASSOCIATION

There appears to be a very good relationship between your department and other programs in the school. For example, when the general science teacher deals with electricity, students usually come into your laboratory to see the practical applications in electricity such as in welders in order to see the effects of resistance in a circuit. Social studies has also been involved with some of the Manufacturing Program.

There appears to be significant support for your program from your principal, Mr. Kevin Bright. In our interview with him, he was very impressed with your judgment and insight and farsightedness in bringing the program along to contemporary industrial technology.

There appears to be a need to modify some of your course material to accommodate new industrial technology information and perhaps even the new course of study format required by the Ohio Department of Education. Joe Logsdon is receptive to working with you to develop a program philosophy, program goals, program objectives, scope and sequence, and course descriptions and objectives to coincide with your course content.

A couple of weeks ago, you received curriculum material from the project office. Included in that material was 16 units developed for elementary school technology education and a unit in Communication for high school. In the near future, you will be receiving new course material developed for the middle school and additional six-week units for high school industrial technology focusing on the four technology systems of Communication, Construction, Energy/Power, and Manufacturing (hopefully you can incorporate some of this into your program). I will also be sending you our format for course development. I would appreciate it if you could rough out your courses along those format lines, particularly the courses for the seventh and eighth grade in order that we may be able to include your course material in any further dissemination of our Model Schools Instructional Materials. Cutting and pasting is all that will be needed from you in order for Marsha, the project secretary, to put that material on the word processor. She will then get it back to you for final review.

Once again, congratulations on your selection as a Satellite Program and continued development as a model program for any middle school technology education program. I believe that the future of our profession rests in the hands of classroom teachers like yourself who are willing to incorporate relevant, contemporary curriculum material into their classroom in order to direct and help our students to become more productive citizens into the 21st century.

Sincerely,

Dr. Ernest N. Savage

Dr. Ernest N. Savage
Project Director

ENS:msb/L41
cc: Mr. Kevin Bright

Mr. Joe Logsdon

AUG 09 1987 REC'D

THE MODEL INDUSTRIAL TECHNOLOGY SYSTEMS PROJECT

June 1, 1987

PROJECT DIRECTOR:
Dr. Ernest N. Savage
Bowling Green State University
(419)-372-8073

PROJECT SECRETARY:
Mrs. Marsha S. Bostelman
Bowling Green State University
(419)-372-8073

PROJECT MONITOR
Mr. Joe R. Logsdon
Ohio Department of Education
(614)-466-2211

CENTRAL SITE:
Dr. Paul E. Post,
Site Co-Director
Dr. William D. Umstattd,
Site Co-Director
The Ohio State University
(614)-422-7471

COLUMBUS CITY SCHOOLS:
Mr. James L. Cameron,
Supervisor Career Education
(614)-464-9101

NORTHEAST SITE:
Dr. Terry J. Squire,
Site Director
Kent State University
(216)-672-2892

SPRINGFIELD LOCAL
(Summit County)
Mr. James D. Gray,
Superintendent
(216)-784-0421

NORTHWEST SITE:
Dr. Ronald E. Jones,
Site Director
Bowling Green State University
(419)-372-7567

SPRINGFIELD LOCAL
(Lucas County)
Mr. George E. Tomlinson,
Superintendent
(419)-866-2400

Mr. John Schroth
Technology Instructor
Chagrin Falls Exempted Village Schools
Middle School
77 East Washington Street
Chagrin Falls, OH 44002

Dear John:

On behalf of the Model Industrial Technology Systems Project, I am pleased to inform you that you have been accepted as a Satellite School Program of the Project. On May 21, 1987, you were visited by Mr. Joe Logsdon from the Ohio Department of Education. His evaluation of your program (enclosed) indicates that you have a dynamic and forward-looking program that can serve as a model to other middle school programs in the state.

In the near future, you will be receiving curriculum material from the project office. Included in that material will be the 16 units developed for elementary school technology education; new course material developed for the middle school (hopefully you can incorporate some of this into your program); and four six-week units for high school industrial technology focusing on the four technology systems of Communication, Construction, Energy/Power, and Manufacturing. I will also be sending you our format for course development. I would appreciate it if you could rough out your courses along those format lines so that we may be able to include your course material in any further dissemination of our Model Schools Instructional Materials. Cutting and pasting is all that will be needed from you in order for Marsha, the project secretary, to put that material on the word processor. She will then get it back to you for final review.

A PROJECT SPONSORED BY THE OHIO DEPARTMENT OF EDUCATION IN COOPERATION WITH THE OHIO INDUSTRIAL TECHNOLOGY EDUCATION ASSOCIATION

Once again, congratulations on your selection as a Satellite Program and continued development as a model program for any middle school technology education program. I believe that the future of our profession rests in the hands of classroom teachers like yourself who are willing to incorporate relevant, contemporary curriculum material into their classroom in order to direct and help our students to become more productive citizens into the 21st century.

Sincerely,

Dr. Ernest N. Savage

Dr. Ernest N. Savage
Project Director

ENS:msb/L36
Enclosure

cc: Mr. Jay Lewis w/enclosure
Mr. Joe Logsdon wo/enclosure

THE MODEL INDUSTRIAL TECHNOLOGY SYSTEMS PROJECT

June 25, 1987

PROJECT DIRECTOR:
Dr. Ernest N. Savage
Bowling Green State University
(419)-372-8873

PROJECT SECRETARY:
Mrs. Marsha S. Bostelman
Bowling Green State University
(419)-372-8873

PROJECT MONITOR
Mr. Joe R. Logsdon
Ohio Department of Education
(614)-466-2211

CENTRAL SITE:
Dr. Paul E. Post,
Site Co-Director
Dr. William D. Umstattd,
Site Co-Director
The Ohio State University
(614)-422-7471

COLUMBUS CITY SCHOOLS:
Mr. James L. Cometari,
Supervisor Career Education
(614)-464-9901

NORTHEAST SITE:
Dr. Terry J. Squier,
Site Director
Kent State University
(216)-672-2892

SPRINGFIELD LOCAL:
(Summit County)
Mr. James D. Gray,
Superintendent
(216)-784-0421

NORTHWEST SITE:
Dr. Ronald E. Jones,
Site Director
Bowling Green State University
(419)-372-7567

SPRINGFIELD LOCAL
(Lucas County)
Dr. George E. Tombaugh,
Superintendent
(419)-866-2400

Mr. Gregory Wilson
2550 Vollmer Dr.
Youngstown, OH 44511

Dear Greg:

On behalf of the Model Industrial Technology Systems Project, I am pleased to inform you that you have been accepted as a Satellite School Program of the Project. On May 7, 1987, you were visited by Mr. Joe Logsdon from the Ohio Department of Education. His evaluation of your program (enclosed) indicates that your program would be an asset to our pilot program and can serve as a model to other high school programs in the state.

In the near future, you will be receiving curriculum material from the project office. Included in that material will be the 16 units developed for elementary school technology education; new course material developed for the middle school; and four six-week units for high school industrial technology focusing on the four technology systems of Communication, Construction, Energy/Power, and Manufacturing (hopefully you can incorporate some of this into your program). I will also be sending you our format for course development. I would appreciate it if you could rough out your courses along those format lines so that we may be able to include your course material in any further dissemination of our Model Schools Instructional Materials. Cutting and pasting is all that will be needed from you in order for Marsha, the project secretary, to put that material on the word processor. She will then get it back to you for final review.

A PROJECT SPONSORED BY THE OHIO DEPARTMENT OF EDUCATION IN COOPERATION WITH THE OHIO INDUSTRIAL TECHNOLOGY EDUCATION ASSOCIATION

Once again, congratulations on your selection as a Satellite Program and continued development as a model program for any high school technology education program. I believe that the future of our profession rests in the hands of classroom teachers like yourself who are willing to incorporate relevant, contemporary curriculum material into their classroom in order to direct and help our students to become more productive citizens into the 21st century.

Sincerely,

Dr. Ernest N. Savage

Dr. Ernest N. Savage
Project Director

ENS:msb/L36
Enclosure

cc: Mr. Joe Logsdon wo/enclosure
Mr. Jay Morgan w/enclosure

THE MODEL INDUSTRIAL TECHNOLOGY SYSTEMS PROJECT

June 25, 1987

PROJECT DIRECTOR:
Dr. Ernest N. Savage
Bowling Green State University
(419)-372-8873

PROJECT SECRETARY:
Mrs. Marsha S. Bostelman
Bowling Green State University
(419)-372-8873

PROJECT MONITOR
Mr. Joe R. Logsdon
Ohio Department of Education
(614)-466-2211

CENTRAL SITE:
Dr. Paul E. Post,
Site Co-Director
Dr. William D. Umstattd,
Site Co-Director
The Ohio State University
(614)-422-7471

COLUMBUS CITY SCHOOLS:
Mr. James L. Cameron,
Supervisor Career Education
(614)-464-9901

NORTHEAST SITE:
Dr. Terry J. Squier,
Site Director
Kent State University
(216)-672-2892

SPRINGFIELD LOCAL:
(Summit County)
Mr. James D. Gray,
Superintendent
(216)-784-0421

NORTHWEST SITE:
Dr. Ronald E. Jones,
Site Director
Bowling Green State University
(419)-372-7567

SPRINGFIELD LOCAL
(Lucas County)
Dr. George E. Tomlough,
Superintendent
(419)-866-2400

Mr. Jon Cotterman
20501 TR5
West LaFayette, OH 43845

Dear Jon:

On behalf of the Model Industrial Technology Systems Project, I am pleased to inform you that you have been accepted as a Satellite School Program of the Project. On May 6, 1987, you were visited by Mr. Joe Logsdon from the Ohio Department of Education. His evaluation of your program (enclosed) indicates that you have a motivating program. A program course of study will hopefully be developed soon.

In the near future, you will be receiving curriculum material from the project office. Included in that material will be the 16 units developed for elementary school technology education; new course material developed for the middle school; and four six-week units for high school industrial technology focusing on the four technology systems of Communication, Construction, Energy/Power, and Manufacturing (hopefully you can incorporate some of this into your program). I will also be sending you our format for course development. I would appreciate it if you could rough out your courses along those format lines so that we may be able to include your course material in any further dissemination of our Model Schools Instructional Materials. Cutting and pasting is all that will be needed from you in order for Marsha, the project secretary, to put that material on the word processor. She will then get it back to you for final review.

A PROJECT SPONSORED BY THE OHIO DEPARTMENT OF EDUCATION IN
COOPERATION WITH THE OHIO INDUSTRIAL TECHNOLOGY EDUCATION ASSOCIATION

Once again, congratulations on your selection as a Satellite Program and continued development as a model program for any high school technology education program. I believe that the future of our profession rests in the hands of classroom teachers like yourself who are willing to incorporate relevant, contemporary curriculum material into their classroom in order to direct and help our students to become more productive citizens into the 21st century.

Sincerely,

Dr. Ernest N. Savage

Dr. Ernest N. Savage
Project Director

ENS:msb/L36
Enclosure

cc: Mr. Joe Logsdon wo/enclosure
Mr. Gary Roberts w/enclosure

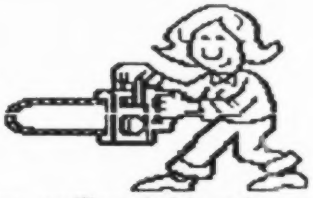
APPENDIX D

Project Publicity

Technology Times

VOL.1 S.M.S. MAY 8,1987

On the 28th-29th of May, Mr.Luton's 2nd, 3rd,and 8th period classes are holding another sensational technology fair. This fair should be the highlight of the 86-87 school year here at Schrop Middle School. The fair will consist of demonstrations in the areas of robotics, aviation,communications,construction of a biosphere,engineering,solar power,tech. modeling.



Dan Davis and Billy Dunn are designing and building a 4'x6' platform that will contain a biosphere made by the 2nd period class.They also will be designing a system for lowering the platform from the ceiling.A biosphere is an airtight environment proposed for use in space or other planet which will produce its own water, oxygen, food and energy.

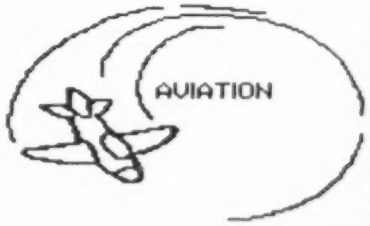
David Groves, Jimmie Lee, Rick Christie and Gary Hopkins have to design and construct a suspended monorail track for the car which the second period class is designing. The monorail track must be capable of supporting ten pounds at any given point. The car will be controlled by a computer which Matt Schwarz and Bryan Slusher are programming on the Commodore 64. They are responsible for the control station containing this program.

John Ross , Chad Salzwimmer, Mike Palmer and Dan Andrews will be cooking their own meal strictly by using solar energy. They must also construct their own equipment for cooking this tasty meal.

Technological models are being constructed by Darrin Poling and Troy Beal. Using the toy shop program they must choose and build a model from the toy shop manuel and prepare a brief report describing this fantastic model they have built.

This fair will also give you a lesson in politeness with the HERO-1 robot greeting you at the door. This robot is programmed by Aron Hill, Santiago Miller and Robert Lane.

Dale Prater, Joe Wrobel and Lance White (of Mr.Luton's third period class) are in competition with the second and eighth period classes. The contest is in the area of engineering. They will be building three devices for the competition: 1-A self-powered device that floats on water, 2-an electrical device that can climb a 10' rope and 3-a device that can remain aloft longer than those of the opposing teams. They feel very confident they will win the competition, but so do the other engineering teams.



Probably the most fun area that the tech. fair is covering is aviation, Jason Miller and Eric Sutton must program and execute a successful flight using the Commodore 128 flight simulator II program. They will also be taking a flight out of Akron Municipal Airport over Schrop taking pictures of the school.

Thank you for reading Tech. Times. Remember the fair is on the 28th-29th.

Written and Published by
Scotty Collier and Phil Schoenfeld.

SMS TECH.ED. NEWS LETTER

MAY 13,1987 | VOL.1

May 28,29 Mr. Lutons classes will be having a technology fair. It will feature project that were done by his students.Teachers ,students and parents are

invited to attend the fair which will run from 11:30 to 1:00 both dates.

The Hero-1 robot will be in the fair,Jon Burky,Lloyd Weimer and Doug Ramsey are working on making the robot follow them while they walk.

There will be another robot there too,Chris Dobbins,Brian Cross and Jason Goodson will be working on that.They are to construct a water reservoir and a stand,then they are to design and program a floating robot which

will retreive an object from the bottom of the reservoir.

There will aiso be a race team, Steve Sainato,

Mike Krummins and Doug Shindler are working this one out.They have to design and build a self-powerd device which floats on water.It must be able to travel 12' without the use of electrical or pre-stored energy.Second,they are

to design and build an electrical device which can climb a ropeto a height of 10'.This third one sounds tricky,they have to design and construct a heavier-than-air device which can aloft longer than any built buy the

opposing teams.

There is a solar energy activity,Danny Lucas,Danny Pennington and Fred Schindler are using equipment which they have designed and constructed they must cook their lunch using solar energy for all of

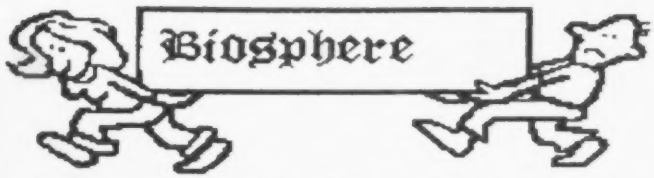
them to eat.

In the aviation group,Chedie Remenyi and Keith Sutton are learning to fly a plane using the Commodore 128 and the Flight SimulatorII program.They are to correctly carry out the flight plan.

The Tech. Ed. Crier

VOLUME 2

A NEWSLETTER OF THE SCHROP MIDDLE SCHOOL SECOND PERIOD TECHNOLOGY. ED. CLASS

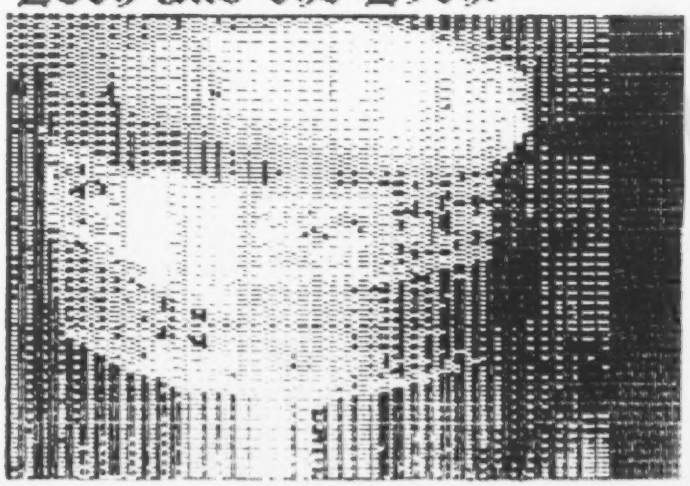


The Tech. Ed. Crier newspaper staff would like to appologize for fogetting two groups out of volume 1. The two are Fishertechnik and Biosphere. These two groups are very important.

Biosphere is going to be built by Gary Freudeman, Joe Mytko, and Jerry Mc Commas. They are going to build a (6x4) model of a Biosphere that will house eight people for a total of two years.

Richard Davis and Erik Bernstien are going to design and build a automated factory out of Fishertechnik parts. The factory will package products on its own.

Be sure to come to the Tech. Ed. Fair on the 28th and the 29th.



R. ERNEST SAVAGE

Updated industrial arts classes: Students build a better bread box

By PHIL HICKS
C-T Staff Writer

There's a revolution brewing in high school industrial arts across Ohio.

The image of industrial arts class — a refuge for lesser-achieving students to pass the time, and maybe make a bookshelf or two, until graduation — is ending.

"You can't qualify wood shop as relevant for a student who will spend most of his life in the 21st century," said Dr. Ernest Savage, associate professor of Industrial Education Technologies at Bowling Green State University.

Savage is one of the driving forces behind the radical shift.

The movement away from the traditional approach began in 1975, when educators from public schools and colleges, along with the Ohio Department of Education, began to look at ways to update industrial arts.

The research resulted in a new curriculum for grades K-12, one with new methods, new aims and a new name.

SCOTT DICKSON

Our society is based on industrial technology, according to Savage. The 20th century has seen rapid advances in technology, and that rate of change is increasing.

THE SHIFT is aimed at acquainting students with what they will face once they get out into the real world.

The overall goal is to teach students how to use everything they've learned to solve a problem or, in other words, how to become technologically literate.

When computers engulfed the workplace and home, many adults who were never prepared for that technology found themselves adrift in a strange land, distrustful or afraid of a machine that seemingly threatened to take over their lives and limit their prospects.

The next generation will be taught how to function in a society increasingly more dependent on technology — how to make it work for them.

Even as consumers, people must stay on top of the advances or drown in the flood of "new." A technologically literate person will be able to intelligently evaluate, buy, operate and maintain a product.

"We were taught to teach about activities with wood and metals — take a casting and turn it into a vise. We weren't taught to deal with problem-solving," Savage said. "We're aiming for more than perso craftsmanship."

. TECHNOLOGY, SAVA said, is not hardware or fa doo-dads. It is knowing how do something efficiently changing material from form to another and increas its value.

"Everything in the wo involves industrial technol systems," Savage said, "
we're trying to get teachers
students to realize it and us as creatively as possible.

"We want to make sure future teachers are trained this approach."

One of those future teach is Scott Dickson, Amherst, w graduated this spring with degree in Industrial Technol Education.

He's been involved in imp menting the first stages of grade school sequence in elementary school near Tole but next fall is aiming for a hi school post.

"I hope to be more of

TURN TO PAGE C-2

Industrial arts

FROM PAGE C-1

facilitator, rather than a teacher," Dickson said. "Students will come up to me and say 'I want to build this,' and I'll say, 'Great, let's find out how to make it.'

"It's amazing how creative students can be."

INSTRUCTION IS based on four primary areas in industrial technology: construction, manufacturing, communication, energy and power.

- Construction involves the skills and tools needed to design, manage and build a structure on a site.
- Manufacturing requires efficient work actions to produce products in a plant.
- Communication technology deals with the problems of physically transmitting information via different methods.
- Energy/Power technology focuses on the work of developing, installing and maintaining machines which create and depend on energy for operating.

These areas overlap, but then so does life. One of the results of this structure is the continuing lesson that a student's entire education is important.

For example, students will realize why there is a need for English. Technical writing is an vital part of manufacturing, but it requires a precise command of the language.

The basic idea of shop classes in high school will be replaced by students learning about technology from the start.

IN ELEMENTARY grades, children learn basic ideas about technology. In the middle or junior high grades students begin exploring ways technology is used, and start to develop their own skills. Once in high school, students will be able to put everything they've learned together.

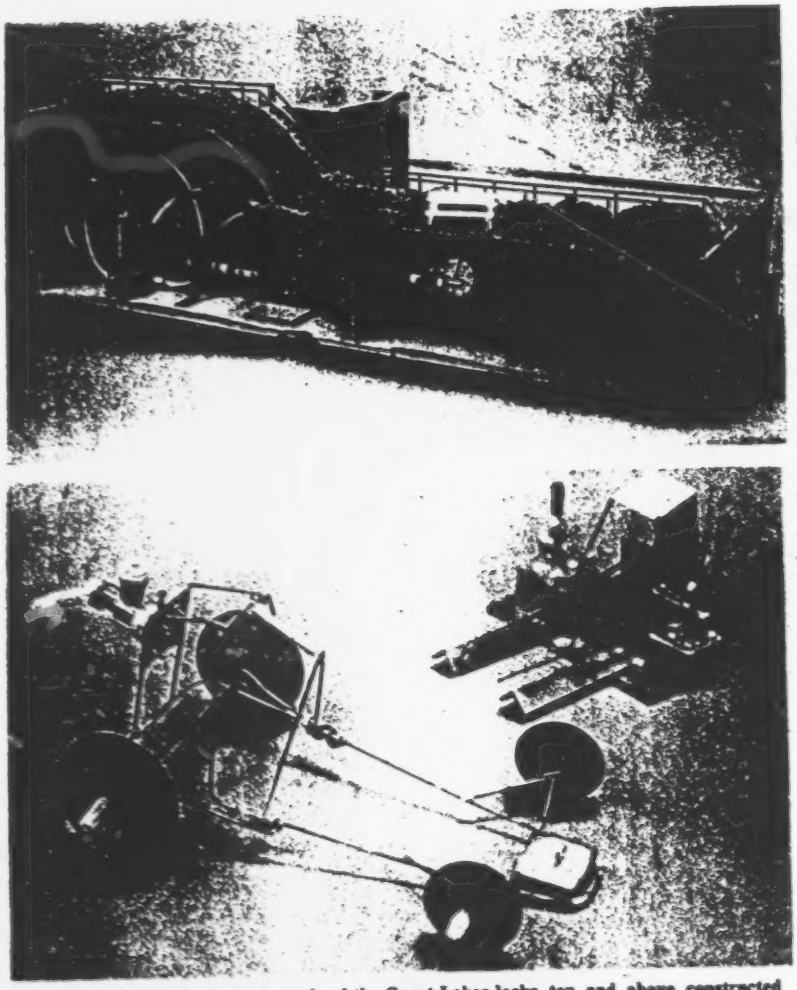
They will be expected to demonstrate those skills by constructing projects that bring together all four areas of technology.

The prototype student project is a scaled, working reproduction of a Great Lakes lock.

"The Great Lakes has been a significant influence on our area," Savage said. "Students can focus on the lock and understand how they were first constructed, compared to how they are built now, and what different technologies were used.

"Kids can use the locks to study energy and power — how they can get they locks to work. They can study manufacturing by having the devise various manufacturing processes to build the locks.

"We're focusing on those concepts, and how they come into play rather than just building a bread box as a class project."



STUDENTS built a working example of the Great Lakes locks, top, and, above, constructed self-propelled cars from clothes hangers and model engines. In both cases students researched, designed, manufactured and operated the projects, following the entire process through as in the real world. (C-T photos)

WEEKLY BLADE Nov. 6, 1986

– Blade Photos By Bruce Sinner

Vick Meko, Scot Hasenaur, and Kevin Hartman, Springfield students, listen to Al Dukate, industrial technology instructor, from left

An Attention Grabber

Robotic Arm Used In Springfield Industrial Technology Classes

By MIKE JONES
Blade Staff Writer

One of the uses of the robotic arm perched on a table in the industrial technology classroom at Springfield High School is to grab the attention of prospective students.

"It wasn't really meant for that purpose," Al Dukate, a teacher in the program said, "but it has gotten a lot of attention.

"Students wander by and ask about it and I'm sure it's increased interest in our classes."

The robotic arm, which operates on a hydraulic system, will be used as part of the power and energy course to be taught next semester in the growing industrial technology curriculum at the school.

No More Bird Feeders

"Parents might once have been used to their children bringing home bird feeders from this kind of class, but that's not the kind of thing we teach anymore," Mr. Dukate said.

Among the tasks of next semester's class will be to add a new function to the arm.

"The arm can pick up a class of pop and move it, but students in the next class will have to devise a way that it can tilt and pour the pop," he said.

The class is being taught as a part of the new curriculum of industrial technology, part of a state-wide program administered through the Springfield Local school district and Bowling Green State University. The administration of the program is funded by a three-year $135,000 grant from the Ohio Department of Education

Designated By State

The high school is one of three in the state designated to begin teaching a curriculum more technologically sophisticated than those normally associated with the "shop" classes of the past.

Mr. Dukate said the number of projects available to students continues to grow as teachers from around the state hold meetings and trade ideas.

One of those meetings will be held Nov. 15 at the high school. About 25 industrial technology teachers around the state will meet to explain projects they have underway in the classes they teach or projects they are planning for the future.

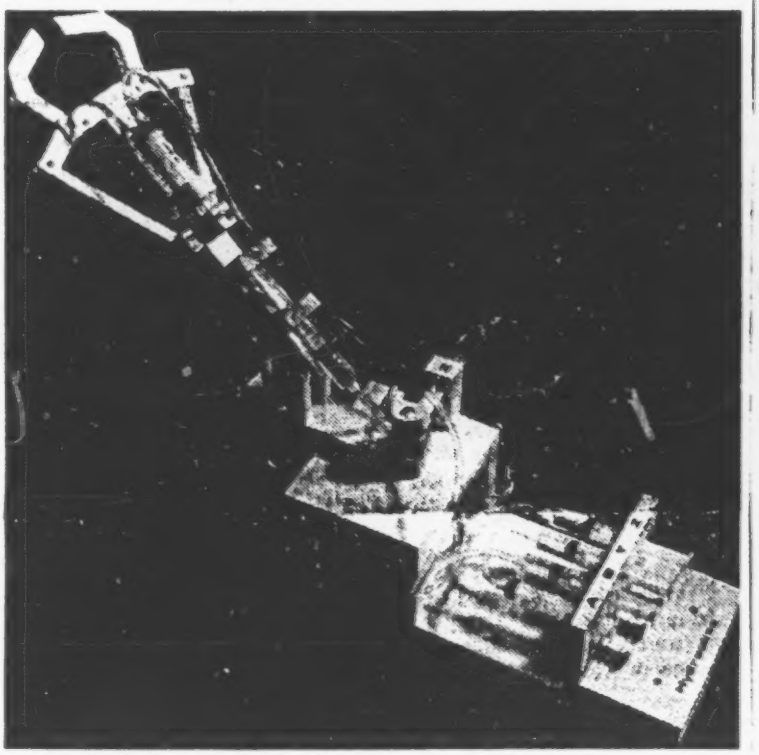
Mr. Dukate said the future of the robotic arm grows with the imagination of other teachers and students.

Use With Computer

He said that after next semester's class has solved the problem of getting a new direction available to the robotic arm, he may decide to have a future class connect the arm to a computer.

It could happen that in the future that the computer will be powered by a source, such a wind machine, which Mr. Dukate is considering having a class construct on school grounds.

"It's how the course grows and how its resources grow," Mr. Dukate said.



Robotic arm uses hydraulic power for movement